

Calve 09/350152

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FILE 'REGISTRY' ENTERED AT 13:36:14 ON 10 AUG 2000  
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STRUCTURE FILE UPDATES: 9 AUG 2000 HIGHEST RN 284660-39-5  
DICTIONARY FILE UPDATES: 9 AUG 2000 HIGHEST RN 284660-39-5

TSCA INFORMATION NOW CURRENT THROUGH JANUARY 11, 2000

Please note that search-term pricing does apply when  
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Structure search limits have been increased. See HELP SLIMIT  
for details.

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(FILE 'HOME' ENTERED AT 13:28:31 ON 10 AUG 2000)

FILE 'REGISTRY' ENTERED AT 13:29:04 ON 10 AUG 2000

L1	1 S 583-91-5	-
L2	0 S 49540-21-9	
L3	1 S 49540-21-8	
L4	1 S 17773-41-0	
L5	1 S 7664-93-9	-sulfuric acid

FILE 'HCAPLUS' ENTERED AT 13:30:10 ON 10 AUG 2000

L6	320 S L1 OR HYDROXY (2W) (METHYLTHIOBUTYR? OR METHYLTHIO BUTYR?)
L7	81731 S L5 OR (SULFURIC OR SULPHURIC) (2W) ACID#
L8	13 S L6 AND L7
L9	52 S L1/P OR (HYDROXY (2W) (METHYLTHIOBUTYR? OR METHYLTHIO BUTYR?)
L10	24 S L9 AND HYDROLYS?
L11	15 S L10 NOT L8

FILE 'REGISTRY' ENTERED AT 13:36:14 ON 10 AUG 2000

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L1 1 SEA FILE=REGISTRY ABB=ON 583-91-5

L1 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2000 ACS

RN 583-91-5 REGISTRY

CN Butanoic acid, 2-hydroxy-4-(methylthio)- (9CI) (CA INDEX NAME)

OTHER CA INDEX NAMES:

CN Butyric acid, 2-hydroxy-4-(methylthio)- (6CI, 8CI)

OTHER NAMES:

CN (+)-2-Hydroxy-4-(methylthio)butyric acid

CN .alpha.-Hydroxy-.gamma.-(methylmercapto)butyric acid

CN .alpha.-Hydroxy-.gamma.-(methylthio)butyric acid

CN .alpha.-Hydroxy-4-(methylthio)butyric acid

CN .gamma.-(Methylmercapto)-.alpha.-hydroxybutyric acid

CN .gamma.-(Methylthio)-.alpha.-hydroxybutyric acid

CN 2-Hydroxy-4-(methylmercapto)butyric acid

CN 2-Hydroxy-4-(methylthio)butanoic acid

CN ~~2-Hydroxy-4-(methylthio)butyric acid~~

CN Alimet

CN Desmenidol

CN DL-.alpha.-Hydroxy-.gamma.-methylmercaptobutyric acid

CN DL-2-Hydroxy-4-(methylmercapto)butanoic acid

CN DL-2-Hydroxy-4-(methylmercapto)butyric acid

CN DL-2-Hydroxy-4-(methylthio)butanoic acid

CN DL-2-Hydroxy-4-(methylthio)butyric acid

CN Hydan L

CN MHA acid

CN MHA-FA

FS 3D CONCORD

DR 120-91-2, 96661-25-5, 110518-19-9

MF C5 H10 O3 S

CI COM

LC STN Files: AGRICOLA, ANABSTR, BEILSTEIN\*, BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CAOLD, CAPLUS, CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CIN, CSCHEM, DDFU, DRUGU, EMBASE, HSDB\*,

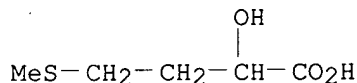
IFICDB,

IFIPAT, IFIUDB, MEDLINE, MRCK\*, PROMT, RTECS\*, SPECINFO, TOXLINE, TOXLIT, USAN, USPATFULL, VETU

(\*File contains numerically searchable property data)

Other Sources: DSL\*\*, EINECS\*\*, TSCA\*\*, WHO

(\*\*Enter CHEMLIST File for up-to-date regulatory information)



247 REFERENCES IN FILE CA (1967 TO DATE)

8 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA

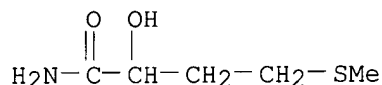
247 REFERENCES IN FILE CAPLUS (1967 TO DATE)

18 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

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L3 1 SEA FILE=REGISTRY ABB=ON 49540-21-8

L3 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2000 ACS  
 RN 49540-21-8 REGISTRY  
 CN Butanamide, 2-hydroxy-4-(methylthio)- (9CI) (CA INDEX NAME)  
 OTHER CA INDEX NAMES:  
 CN Butyramide, 2-hydroxy-4-(methylthio)- (6CI)  
 OTHER NAMES:  
 CN 2-Hydroxy-4-(methylthio)butanamide  
 CN 2-Hydroxy-4-(methylthio)butyramide  
 FS 3D CONCORD  
 MF C5 H11 N O2 S  
 LC STN Files: BEILSTEIN\*, CA, CAOLD, CAPLUS, CASREACT, IFICDB, IFIPAT,  
 IFIUDB, TOXLIT, USPATFULL  
 (\*File contains numerically searchable property data)



24 REFERENCES IN FILE CA (1967 TO DATE)  
 24 REFERENCES IN FILE CAPLUS (1967 TO DATE)  
 2 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

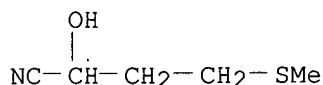
=&gt; d que 14;d 14

L4 1 SEA FILE=REGISTRY ABB=ON 17773-41-0

L4 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2000 ACS  
 RN 17773-41-0 REGISTRY  
 CN Butanenitrile, 2-hydroxy-4-(methylthio)- (9CI) (CA INDEX NAME)  
 OTHER CA INDEX NAMES:  
 CN Butyronitrile, 2-hydroxy-4-(methylthio)- (6CI, 7CI, 8CI)  
 OTHER NAMES:  
 CN .alpha.-Hydroxy-4-(methylthio)butyronitrile  
 CN 2-Hydroxy-4-(methylthio)butanenitrile  
 CN 2-Hydroxy-4-(methylthio)butyronitrile  
 CN 3-(Methylmercapto)propionaldehyde cyanohydrin  
 FS 3D CONCORD  
 DR 67550-70-3  
 MF C5 H9 N O S  
 LC STN Files: BEILSTEIN\*, CA, CAOLD, CAPLUS, CASREACT, CHEMCATS,  
 CHEMINFORMRX, CHEMLIST, IFICDB, IFIPAT, IFIUDB, RTECS\*, TOXLINE,  
 TOXLIT,

USPATFULL

(\*File contains numerically searchable property data)  
Other Sources: EINECS\*\*, NDSL\*\*, TSCA\*\*  
(\*\*Enter CHEMLIST File for up-to-date regulatory information)



58 REFERENCES IN FILE CA (1967 TO DATE)  
58 REFERENCES IN FILE CAPLUS (1967 TO DATE)  
3 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

L5 = 7664-93-9 = sulfuric acid (forgot to print out)  
=> fil hcaplus

~~FILE 'HCAPLUS'~~ ENTERED AT 13:36:47 ON 10 AUG 2000  
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FILE COVERS 1967 - 10 Aug 2000 VOL 133 ISS 7  
FILE LAST UPDATED: 9 Aug 2000 (20000809/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

This file supports REGISTRY for direct browsing and searching of all substance data from the REGISTRY file. Enter HELP FIRST for more information.

Now you can extend your author, patent assignee, patent information, and title searches back to 1907. The records from 1907-1966 now have this searchable data in CAOLD. You now have electronic access to all of CA: 1907 to 1966 in CAOLD and 1967 to the present in HCAPLUS on STN. 'OBI' IS DEFAULT SEARCH FIELD FOR 'HCAPLUS' FILE

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~~(FILE 'REGISTRY' ENTERED AT 13:29:04 ON 10 AUG 2000)~~  
L5 1 S 7664-93-9

FILE 'HCAPLUS' ENTERED AT 13:30:10 ON 10 AUG 2000  
L6 320 S L1 OR HYDROXY (2W) (METHYLTHIOBUTYR? OR METHYLTHIO BUTYR?)  
L7 81731 S L5 OR (SULFURIC OR SULPHURIC) (2W) ACID#  
L8 13 S L6 AND L7  
L9 52 S L1/P OR (HYDROXY (2W) (METHYLTHIOBUTYR? OR METHYLTHIO BUTYR?)

L10 24 S L9 AND HYDROLYS?  
 L11 ~~15 S L10~~ NOT L8

FILE 'REGISTRY' ENTERED AT 13:36:14 ON 10 AUG 2000

FILE 'HCAPLUS' ENTERED AT 13:36:47 ON 10 AUG 2000

=> d .ca 18 1-13;d .ca 111 1-15

L8 ANSWER 1 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 2000:344468 HCAPLUS  
 DOCUMENT NUMBER: 132:321720  
 TITLE: Preparation of .alpha.-hydroxy carboxylic acids  
 INVENTOR(S): Mizuno, Masanori; Shioiri, Takayuki  
 PATENT ASSIGNEE(S): Eisai Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000143581	A2	20000523	JP 1999-244473	19990831
PRIORITY APPLN. INFO.:			JP 1998-244790	19980831
OTHER SOURCE(S): CASREACT 132:321720; MARPAT 132:321720				
AB Title compds. R1CH(OH)CO2H (R1 = alkyl, alkenyl, cycloalkyl, aryl, heteroaryl) are prepd. by reaction of R1CO2H with NCP(O)(OR2)2 (R2 = alkyl) in the presence of bases and treatment of R1C(CN)2OP(O)(OR2)2 with acids or bases. For example, reaction of pentanoic acid with di-Et cyanophosphonate in THF in the presence of Et3N at -20.degree. for 3 h gave 72% di-Et 1,1-dicyanopentyl phosphonate, which was refluxed in concd. HCl for 12 h to give 96% 2-hydroxyhexanoic acid.				
IC ICM C07C059-01				
ICS C07C051-00; C07C051-08; C07C051-38; C07C059-50; C07C059-56; C07C059-64; C07C319-20; C07C323-52; C07F009-38				
CC 25-17 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)				
IT 90-64-2P 492-86-4P <b>583-91-5P</b> 4026-18-0P 4026-20-4P				
4442-94-8P 6064-63-7P 10421-85-9P 18584-20-8P 21150-12-9P				
85589-35-1P 219789-87-4P				
RL: IMF (Industrial manufacture); SPN (Synthetic preparation); PREP (Preparation)				
(prepn. of .alpha.-hydroxy carboxylic acids)				
IT 65-85-0, Benzoic acid, reactions 74-11-3 75-98-9 79-31-2 98-89-5, Cyclohexanecarboxylic acid 99-94-5 109-52-4, Pentanoic acid, reactions				
118-90-1 118-91-2 586-38-9 646-01-5 2942-58-7, Diethyl cyanophosphonate 7601-90-3, Perchloric acid, reactions 7647-01-0, Hydrochloric acid, reactions 7664-38-2, Phosphoric acid, reactions <b>7664-93-9, Sulfuric acid, reactions</b> 7697-37-2, Nitric acid, reactions 10034-85-2, Hydroiodic acid 10035-10-6, Hydrobromic acid, reactions				
RL: RCT (Reactant)				
(prepn. of .alpha.-hydroxy carboxylic acids)				

L8 ANSWER 2 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 2000:53577 HCAPLUS  
 DOCUMENT NUMBER: 132:78292  
 TITLE: Extraction method for separating 2-hydroxy  
 -4-(methylthio)butyric acid from  
 its sulfuric acid-containing  
 production reaction mixture  
 INVENTOR(S): Carencotte, Frederic; Garrait, Michel; Gros, Georges  
 PATENT ASSIGNEE(S): Rhone-Poulenc Animal Nutrition S.A., Fr.  
 SOURCE: PCT Int. Appl., 23 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000002853	A1	20000120	WO 1999-FR1636	19990707
W: AE, AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, SL, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
FR 2780969	A1	20000114	FR 1998-8874	19980710
AU 9946244	A1	20000201	AU 1999-46244	19990707
PRIORITY APPLN. INFO.: FR 1998-8874 19980710 WO 1999-FR1636 19990707				
AB 2-Hydroxy-4-(methylthio)butyric acid, an animal feed supplement (no data), is sepd. from its sulfuric acid-contg., 2-hydroxy-4-(methylthio)butyronitrile-hydrolysis reaction mixt. by neutralization with ammonium hydroxide, decanting the reaction mixt., and extg. each phase with an org. solvent (e.g., MEK).				
IC	ICM C07C323-52 ICS C07C319-28			
CC	23-16 (Aliphatic Compounds) Section cross-reference(s): 17, 48			
IT	Carboxylic acids, uses RL: NUU (Nonbiological use, unclassified); USES (Uses) (esters, extn. solvents; extn. method for sepg. 2-hydroxy-4-(methylthio)butyric acid from its sulfuric acid-contg. prodn. reaction mixt. using)			
IT	Alcohols, uses Aldehydes, uses Ethers, uses Ketones, uses RL: NUU (Nonbiological use, unclassified); USES (Uses) (extn. solvents; extn. method for sepg. 2-hydroxy-4-(methylthio)butyric acid from its sulfuric acid-contg. prodn. reaction mixt. using)			
IT	Extraction (of 2-hydroxy-4-(methylthio)butyric acid			

from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT Electrodialysis  
(of ammonium hydroxide in an extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT Neutralization  
(with ammonium hydroxide of a **sulfuric acid**-contg., 2-**hydroxy**-4-(**methylthio**)**butyronitrile** -hydrolysis reaction mixt. in the manuf. of 2-**hydroxy**-4-(**methylthio**)**butyric** acid)

IT 583-91-5P, 2-**Hydroxy**-4-(**methylthio**)**butyric** acid  
RL: FFD (Food or feed use); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation); USES (Uses)  
(extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT 7732-18-5, Water, uses  
RL: NUU (Nonbiological use, unclassified); REM (Removal or disposal); PROC (Process); USES (Uses)  
(extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT 1336-21-6P, Ammonium hydroxide  
RL: PUR (Purification or recovery); RCT (Reactant); PREP (Preparation)  
(extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT 7664-93-9, **Sulfuric acid**, reactions  
RL: RCT (Reactant); REM (Removal or disposal); PROC (Process)  
(extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

IT 78-93-3, Mek, uses 105-58-8, Diethyl carbonate 108-10-1, Mibk 108-20-3, Diisopropyl ether 463-79-6D, Carbonic acid, org. diesters 1634-04-4, Mtbe  
RL: NUU (Nonbiological use, unclassified); USES (Uses)  
(extn. solvents; extn. method for sepg. 2-**hydroxy**-4-(**methylthio**)**butyric** acid from its **sulfuric acid**-contg. prodn. reaction mixt.)

REFERENCE COUNT: 5

REFERENCE(S): (1) Batelle-Institut Ev; DE 2727409 A 1979 HCAPLUS  
(2) Degussa Ag; WO 9723452 A 1997  
(3) Gielkens, J; US 3175000 A 1965  
(4) Monsanto Co; EP 0143100 A 1985  
(5) Sociedad de Desarrollo Technico Industrial; EP 0330527 A 1989

L8 ANSWER 3 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 2000:53574 HCAPLUS

DOCUMENT NUMBER: 132:78291

TITLE: Two-step hydrolytic method for preparing 2-**hydroxy**-4-(**methylthio**)**butyric** acid from 2-**hydroxy**-4-(**methylthio**)**butyronitrile** using

**sulfuric acid and water**

INVENTOR(S): Garrait, Michel; Gros, Georges  
 PATENT ASSIGNEE(S): Rhone-Poulenc Animal Nutrition S.A., Fr.  
 SOURCE: PCT Int. Appl., 24 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000002852	A1	20000120	WO 1999-FR1637	19990707
W: AE, AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, SL, TR, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
FR 2780968	A1	20000114	FR 1998-8872	19980710
AU 9946245	A1	20000201	AU 1999-46245	19990707
PRIORITY APPLN. INFO.:			FR 1998-8872	19980710
			WO 1999-FR1637	19990707

OTHER SOURCE(S): CASREACT 132:78291

AB 2-Hydroxy-4-(methylthio)butyric acid, useful as an animal feed supplement (no data), is prepd. in high yield and selectivity by the two-step sulfuric acid hydrolysis of 2-hydroxy-4-(methylthio)butyronitrile (I) using a 0.6-0.88 M quantity of the sulfuric acid relative to I and in the presence of 1-3 mol of water per mol of I at .ltoreq.60.degree. to form 2-hydroxy-4-(methylthio)butyramide which is then subjected to a second hydrolysis with sulfuric acid in the presence of a supplementary quantity of water.

IC ICM C07C319-20

ICS C07C323-52

CC 23-16 (Aliphatic Compounds)

Section cross-reference(s): 17, 48

ST hydroxymethylthiobutyric acid prepn hydrolysis

hydroxymethylthiobutyronitrile; **sulfuric acid**

IT hydrolysis hydroxymethylthiobutyronitrile prepn hydroxymethylthiobutyric

Hydrolysis

(two-step hydrolytic method for prepg. 2-hydroxy-4-(

**methylthio)butyric acid from 2-hydroxy-4-(**

**methylthio)butyronitrile using sulfuric**

**acid and water)**

IT 583-91-5P, 2-Hydroxy-4-(methylthio)

butyric acid

RL: FFD (Food or feed use); IMF (Industrial manufacture); BIOL

(Biological

study); PREP (Preparation); USES (Uses)

(two-step hydrolytic method for prepg. 2-hydroxy-4-(

**methylthio)butyric acid from 2-hydroxy-4-(**

**methylthio)butyronitrile using sulfuric**

**acid and water)**

IT 49540-21-8P, 2-Hydroxy-4-(methylthio)

butyramide

RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation)



(two-step hydrolytic method for prepg. 2-hydroxy-4-(  
**methylthio)butyric acid** from 2-hydroxy-4-(  
**methylthio)butyronitrile** using **sulfuric acid** and water)

IT 7732-18-5, Water, reactions  
 RL: NUU (Nonbiological use, unclassified); RCT (Reactant); USES (Uses)  
 (two-step hydrolytic method for prepg. 2-hydroxy-4-(  
**methylthio)butyric acid** from 2-hydroxy-4-(  
**methylthio)butyronitrile** using **sulfuric acid** and water)

IT 7664-93-9, Sulfuric acid, reactions  
 17773-41-0, 2-Hydroxy-4-(**methylthio**)  
**butyronitrile**  
 RL: RCT (Reactant)  
 (two-step hydrolytic method for prepg. 2-hydroxy-4-(  
**methylthio)butyric acid** from 2-hydroxy-4-(  
**methylthio)butyronitrile** using **sulfuric acid** and water)

REFERENCE COUNT: 3  
 REFERENCE(S): (1) Blake, E; US 2938053 A 1960  
 (2) Hernandez, J; US 4912257 A 1990  
 (3) Ruest, D; US 4524077 A 1985

L8 ANSWER 4 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 1999:384104 HCAPLUS  
 DOCUMENT NUMBER: 131:7217  
 TITLE: Method for recovery of **sulfuric acid**  
 from byproducts containing sulfur from a process for  
 preparation of 2-hydroxy-4-  
**methylthiobutyric acid** (MHA)

INVENTOR(S): Hasseberg, Hans-albrecht; Hasselbach, Hans-Joachim;  
 Huthmacher, Klaus; Haefner, Volker; Heinzl, Harald

PATENT ASSIGNEE(S): Degussa-Huels A.-G., Germany

SOURCE: Ger. Offen., 10 pp.  
 CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 19754562	A1	19990610	DE 1997-19754562	19971209
EP 922670	A1	19990616	EP 1998-122921	19981202
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 11246207	A2	19990914	JP 1998-347215	19981207
AU 9896987	A1	19990701	AU 1998-96987	19981208
CN 1223230	A	19990721	CN 1998-123185	19981209
BR 9805253	A	20000201	BR 1998-5253	19981209
PRIORITY APPLN. INFO.:			DE 1997-19754562	19971209

AB A process for recovery of H<sub>2</sub>SO<sub>4</sub> from S-contg. byproducts, resulting from MHA prepn., yields H<sub>2</sub>SO<sub>4</sub> of a quality suitable for direct reuse in the process. The SO<sub>2</sub>-contg. combustion gas is passed to a H<sub>2</sub>SO<sub>4</sub>-H<sub>2</sub>O<sub>2</sub> soln.  
 in which SO<sub>2</sub> is oxidized to H<sub>2</sub>SO<sub>4</sub>.

IC ICM C01B017-90

ICS C01B017-74; C07C327-06; B09B003-00  
 CC 49-2 (Industrial Inorganic Chemicals)  
 Section cross-reference(s): 45  
 ST **sulfuric acid** recovery hydroxymethylthiobutyric acid  
 manuf  
 IT Combustion gases  
 (method for recovery of **sulfuric acid** from  
 byproducts contg. sulfur from process for prepn. of 2-hydroxy  
 -4-methylthiobutyric acid)  
 IT 7446-09-5P, Sulfur dioxide, preparation  
 RL: BYP (Byproduct); RCT (Reactant); PREP (Preparation)  
 (method for recovery of **sulfuric acid** from  
 byproducts contg. sulfur from process for prepn. of 2-hydroxy  
 -4-methylthiobutyric acid)  
 IT 583-91-5P, 2-Hydroxy-4-methylthiobutyric acid  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (method for recovery of **sulfuric acid** from  
 byproducts contg. sulfur from process for prepn. of 2-hydroxy  
 -4-methylthiobutyric acid)  
 IT 7664-93-9P, Sulfuric acid, preparation  
 RL: PUR (Purification or recovery); PREP (Preparation)  
 (method for recovery of **sulfuric acid** from  
 byproducts contg. sulfur from process for prepn. of 2-hydroxy  
 -4-methylthiobutyric acid)  
 IT 7722-84-1, Hydrogen peroxide, reactions  
 RL: RCT (Reactant)  
 (method for recovery of **sulfuric acid** from  
 byproducts contg. sulfur from process for prepn. of 2-hydroxy  
 -4-methylthiobutyric acid)

L8 ANSWER 5 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1999:34521 HCAPLUS  
 DOCUMENT NUMBER: 130:83195  
 TITLE: Continuous hydrolysis process for preparing  
 2-hydroxy-4-(methylthio)butanoic acid or its salts  
 from 2-hydroxy-4-(methylthio)  
**butyronitrile** by way of the amide intermediate  
 INVENTOR(S): Hsu, Yung C.; Blackburn, Thomas F.; Pellegrin, Paul  
 F.; Kranz, Allen H.; Willock, James M.  
 PATENT ASSIGNEE(S): Novus International, Inc., USA  
 SOURCE: U.S., 34 pp., Cont.-in-part of U.S. Ser. No. 477,768,  
 abandoned.  
 CODEN: USXXAM  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5856567	A	19990105	US 1996-647161	19960521
WO 9640630	A1	19961219	WO 1996-US8527	19960604
W:	AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI			
RW:	KE, LS, MW, SD, SZ, UG, AT, BE, CH, DE, DK, ES, FI, FR, GB, GR,			

IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML

AU 9659741	A1	19961230	AU 1996-59741	19960604
EP 832062	A1	19980401	EP 1996-917048	19960604

R: BE, DE, DK, ES, FR, GB, IT, LU, NL, MC, PT, IE

CN 1189819	A	19980805	CN 1996-195193	19960604
BR 9609182	A	19990511	BR 1996-9182	19960604
JP 11508876	T2	19990803	JP 1996-501098	19960604
US 5998664	A	19991207	US 1997-876011	19970613
			US 1995-477768	19950607
			US 1996-647161	19960521
			WO 1996-US8527	19960604

PRIORITY APPLN. INFO.:

AB A continuous process for the prepn. of 2-hydroxy-4-methylthiobutanoic acid  
(I), or its salts, comprises introducing an aq. mineral acid (e.g., aq. sulfuric acid) into a nitrile hydrolysis reactor (i.e., a continuous stirred tank reactor) and introducing 2-hydroxy-4-methylthiobutanenitrile into the reactor to produce a continuous hydrolysis product stream contg. 2-hydroxy-4-methylthiobutanamide. The reactor hydrolysis product stream is continuously introduced into an amide hydrolysis flow reactor and continually hydrolyzed to an aq. I-contg. hydrolyzate.

IC ICM C07C381-00  
ICS C07C051-42

NCL 562581000

CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)  
Section cross-reference(s): 23, 48

IT Inorganic acids  
RL: RCT (Reactant)  
(continuous hydrolysis process for prepg. 2-hydroxy-4-(methylthio)butanoic acid or its salts from 2-hydroxy-4-(methylthio)butyronitrile using)

IT Hydrolysis  
(for prepg. 2-hydroxy-4-(methylthio)butanoic acid or its salts from 2-hydroxy-4-(methylthio)butyronitrile)

IT 583-91-5DP, 2-Hydroxy-4-(methylthio)butanoic acid, salts  
583-91-5P, 2-Hydroxy-4-(methylthio)butanoic acid  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(continuous hydrolysis process for prepg. 2-hydroxy-4-(methylthio)butanoic acid or its salts from 2-hydroxy-4-(methylthio)butyronitrile by way of the amide intermediate)

IT 49540-21-8P, 2-Hydroxy-4-(methylthio)butanamide  
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation)  
(continuous hydrolysis process for prepg. 2-hydroxy-4-(methylthio)butanoic acid or its salts from 2-hydroxy-4-(methylthio)butyronitrile by way of the amide intermediate)

IT 7732-18-5, Water, reactions  
RL: NUU (Nonbiological use, unclassified); RCT (Reactant); USES (Uses)  
(continuous hydrolysis process for prepg. 2-hydroxy-4-(methylthio)butanoic acid or its salts from 2-hydroxy-4-(methylthio)butyronitrile by way of the amide intermediate)

IT 7664-93-9, Sulfuric acid, reactions  
17773-41-0, 2-Hydroxy-4-(methylthio)butyronitrile  
RL: RCT (Reactant)  
(continuous hydrolysis process for prepg. 2-hydroxy-4-

(methylthio)butanoic acid or its salts from 2-hydroxy-4-(  
**methylthio)butyronitrile** by way of the amide  
 intermediate)

REFERENCE COUNT: 16  
 REFERENCE(S): (1) Abdel-Monem; US 5583243 1996  
 (2) Anagnostopoulos; US 2946818 1960  
 (3) Anon; EP 0143100 1984 HCAPLUS  
 (4) Bernard; US 2676190 1954  
 (5) Denbigh; Chemical Reactor Theory 1965, P38  
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L8 ANSWER 6 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1998:608415 HCAPLUS

DOCUMENT NUMBER: 129:204429

TITLE: Method for separating ammonium sulfate and ammonium  
 bisulfate from each other and a hydrolysis process

for

producing 2-hydroxy-4-methylthiobutanoic acid  
 utilizing this phase-separation method

INVENTOR(S): Shiozaki, Tetsuya; Ikudome, Kenji  
 PATENT ASSIGNEE(S): Sumitomo Chemical Co., Ltd., Japan  
 SOURCE: Eur. Pat. Appl., 13 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 863135	A2	19980909	EP 1998-103840	19980304
EP 863135	A3	19981209		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 10306072	A2	19981117	JP 1997-248592	19970912
US 5973198	A	19991026	US 1998-32953	19980302
CN 1201031	A	19981209	CN 1998-108598	19980303
PRIORITY APPLN. INFO.:			JP 1997-49029	19970304
			JP 1997-248592	19970912

AB 2-Hydroxy-4-methylthiobutanoic acid (I) is prepd. in high yield and  
 selectivity by the hydrolysis of 2-hydroxy-4-methylthiobutyronitrile with  
 aq. sulfuric acid in the presence of ammonium bisulfate, the I is  
 recovered from the resulting org. layer, a water-miscible org. solvent  
 (e.g., acetone) is added to the aq. layer to deposit ammonium sulfate,  
 and  
 the remaining ammonium bisulfate is recovered from the aq. layer. This  
 method enables the com. recycling and reusing of ammonium bisulfate,  
 reduces the amt. of sulfuric acid used, produces substantially no waste  
 water contg. sulfates, has a low operation cost, and is an  
 environmentally  
 friendly process.

IC ICM C07C319-20  
 ICS C07C323-52; C01C001-24

CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)  
 Section cross-reference(s): 17, 23, 48

IT Hydrolysis  
 (of 2-hydroxy-4-methylthiobutyronitrile with aq.

**sulfuric acid** in the presence of ammonium bisulfate  
in the manuf. of 2-hydroxy-4-methylthiobutanoic acid)

IT **583-91-5P**, 2-Hydroxy-4-methylthiobutanoic acid  
RL: IMF (Industrial manufacture); SPN (Synthetic preparation); PREP  
(Preparation)  
(method for sepg. ammonium sulfate and ammonium bisulfate from each  
other and a hydrolysis process for producing 2-hydroxy-4-  
methylthiobutanoic acid utilizing this phase-sepn. method)

IT **7664-93-9**, **Sulfuric acid**, reactions  
17773-41-0, 2-Hydroxy-4-methylthiobutyronitrile  
RL: RCT (Reactant)  
(method for sepg. ammonium sulfate and ammonium bisulfate from each  
other and a hydrolysis process for producing 2-hydroxy-4-  
methylthiobutanoic acid utilizing this phase-sepn. method)

L8 ANSWER 7 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
ACCESSION NUMBER: 1998:442074 HCAPLUS  
DOCUMENT NUMBER: 129:96853  
TITLE: Procedure for the production of storage-stable 2-  
**hydroxy-4-methylthiobutyric acid**  
INVENTOR(S): Hasseberg, Hans-Albrecht; Hasselbach, Hans Joachim;  
Huthmacher, Klaus; Haefner, Volker; Heinzl, Harald;  
Ronneburg, Axel  
PATENT ASSIGNEE(S): Degussa A.-G., Germany  
SOURCE: Ger. Offen., 30 pp.  
CODEN: GWXXBX  
DOCUMENT TYPE: Patent  
LANGUAGE: German  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 19654485	A1	19980702	DE 1996-19654485	19961227
BE 1011834	A3	20000201	BE 1997-1026	19971216
FR 2757854	A1	19980703	FR 1997-16314	19971223
FR 2757854	B1	20000512		
JP 10195045	A2	19980728	JP 1997-355081	19971224
CN 1186068	A	19980701	CN 1997-125703	19971225
BR 9706466	A	19990601	BR 1997-6466	19971226
US 6008409	A	19991228	US 1997-999000	19971229
			DE 1996-19654485	19961227

PRIORITY APPLN. INFO.:  
AB Storage-stable 2-hydroxy-4-methylthiobutyric acid (I) is prepd. by the  
quick vacuum distn. of highly concd., liq. I, having a monomer and  
oligomer concn. of >95%, so as to avoid byproduct formation.

IC ICM C07C323-52  
ICS C07C319-26; A23K001-16; A61K031-19

CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)  
Section cross-reference(s): 48

IT Vacuum distillation  
(for the prodn. of storage-stable 2-hydroxy-4-  
**methylthiobutyric acid**)

IT Hydrolysis  
(in the prodn. of storage-stable 2-hydroxy-4-  
**methylthiobutyric acid**)

IT Feed  
(supplement; ammonium 2-hydroxy-4-methylthiobutyrate

)  
 IT 63302-72-7P  
 RL: FFD (Food or feed use); IMF (Industrial manufacture); BIOL  
 (Biological  
 study); PREP (Preparation); USES (Uses)  
 (procedure for the prodn. of storage-stable 2-hydroxy-4-  
 methylthiobutyric acid)  
 IT 583-91-5P, 2-Hydroxy-4-methylthiobutyric acid  
 RL: IMF (Industrial manufacture); PUR (Purification or recovery); RCT  
 (Reactant); PREP (Preparation)  
 (procedure for the prodn. of storage-stable 2-hydroxy-4-  
 methylthiobutyric acid)  
 IT 74-90-8, Hydrogen cyanide, reactions 3268-49-3, 3-  
 (Methylmercapto)propionaldehyde 7647-01-0, Hydrogen chloride, reactions  
 7664-38-2, Phosphoric acid, reactions 7664-93-9,  
 Sulfuric acid, reactions  
 RL: RCT (Reactant)  
 (procedure for the prodn. of storage-stable 2-hydroxy-4-  
 methylthiobutyric acid)  
 IT 583-91-5D, 2-Hydroxy-4-methylthiobutyric acid,  
 oligomers and dimers  
 RL: RCT (Reactant); REM (Removal or disposal); PROC (Process)  
 (procedure for the prodn. of storage-stable 2-hydroxy-4-  
 methylthiobutyric acid)  
 L8 ANSWER 8 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 1997:436394 HCAPLUS  
 DOCUMENT NUMBER: 127:50297  
 TITLE: Process for the extractive recovery of 2-  
 hydroxy-4-(methylthio)  
 butyric acid  
 INVENTOR(S): Hasseberg, Hans-Albrecht Dr; Hasselbach, Hans-Joachim  
 Dr; Huthmacher, Klaus; Haefner, Volker; Heinzl,  
 Harald; Jaeger, Barbara  
 PATENT ASSIGNEE(S): Degussa AG, Germany  
 SOURCE: Ger. Offen., 29 pp.  
 CODEN: GWXXBX  
 DOCUMENT TYPE: Patent  
 LANGUAGE: German  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 19548538	A1	19970626	DE 1995-19548538	19951223
DE 19548538	C2	19971218		
WO 9723452	A1	19970703	WO 1996-EP5437	19961205
W: AU, BR, BY, CA, CN, CZ, HU, JP, KP, KR, MX, NO, NZ, PL, RU, SG, SI, SK, TR, UA, US, VN				
RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT,				
SE AU 9711906	A1	19970717	AU 1997-11906	19961205
AU 717705	B2	20000330		
EP 874811	A1	19981104	EP 1996-943038	19961205
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
CN 1205688	A	19990120	CN 1996-199293	19961205

BR 9612235 A 19990713 BR 1996-12235 19961205  
JP 2000502110 T2 20000222 JP 1997-523255 19961205  
PRIORITY APPLN. INFO.: DE 1995-19548538 19951223  
WO 1996-EP5437 19961205

AB 2-Hydroxy-4-(methylthio)butyric acid, prepd. by the reaction of HCN with  
3-(methylmercapto)propionaldehyde and followed by the sulfuric acid  
hydrolysis of the intermediate cyanohydrins, is recovered by liq.-liq.  
extn. from the reaction mixt. using an org. solvent (e.g., MTBE) and  
maintaining the aq. reaction mixt.'s salt (i.e., the sum of the nonorg.  
components) content at 50-55% prior to extn. Process flow diagrams are  
presented.

IC ICM C07C323-52  
ICS C07C319-20; C07C319-28; C07C043-04

CC 23-16 (Aliphatic Compounds)  
Section cross-reference(s): 45, 48

IT Extraction  
(process for the extractive recovery of 2-hydroxy-4-(  
**methylthio**)butyric acid)

IT 583-91-5P, 2-Hydroxy-4-(methylthio)  
butyric acid  
RL: IMF (Industrial manufacture); PUR (Purification or recovery); PREP  
(Preparation)  
(process for the extractive recovery of 2-hydroxy-4-(  
**methylthio**)butyric acid)

IT 17773-41-0P, 3-(Methylmercapto)propionaldehyde cyanohydrin  
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation)  
(process for the extractive recovery of 2-hydroxy-4-(  
**methylthio**)butyric acid)

IT 74-90-8, Hydrogen cyanide, reactions 1634-04-4, MTBE 3268-49-3,  
3-(Methylmercapto)propionaldehyde 7664-93-9, Sulfuric  
acid, reactions 7732-18-5, Water, reactions  
RL: RCT (Reactant)  
(process for the extractive recovery of 2-hydroxy-4-(  
**methylthio**)butyric acid)

L8 ANSWER 9 OF 13 HCAPLUS COPYRIGHT 2000 ACS  
ACCESSION NUMBER: 1997:121421 HCAPLUS  
DOCUMENT NUMBER: 126:131191  
TITLE: Continuous hydrolysis process for preparation of  
2-hydroxy-4-methylthiobutanoic acid or its salts  
INVENTOR(S): Hsu, Yung C.; Blackburn, Thomas F.; Pellegrin, Paul  
F.; Kranz, Allen H.; Willock, James M.  
PATENT ASSIGNEE(S): Novus International, Inc., USA  
SOURCE: PCT Int. Appl., 125 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 2  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9640630	A1	19961219	WO 1996-US8527	19960604
W:	AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI			

RW: KE, LS, MW, SD, SZ, UG, AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML

US 5856567 A 19990105 US 1996-647161 19960521  
 AU 9659741 A1 19961230 AU 1996-59741 19960604  
 EP 832062 A1 19980401 EP 1996-917048 19960604

R: BE, DE, DK, ES, FR, GB, IT, LU, NL, MC, PT, IE

BR 9609182 A 19990511 BR 1996-9182 19960604  
 JP 11508876 T2 19990803 JP 1996-501098 19960604

PRIORITY APPLN. INFO.: US 1995-477768 19950607  
 US 1996-647161 19960521  
 WO 1996-US8527 19960604

AB The process includes introducing an aq. mineral acid (esp. concd. H<sub>2</sub>SO<sub>4</sub>) into a nitrile hydrolysis reactor including a continuously stirred tank reactor and introducing 2-hydroxy-4-methylthiobutanenitrile into the nitrile hydrolysis reactor. 2-Hydroxy-4-methylthiobutanenitrile is continually hydrolyzed to produce a product stream contg. 2-hydroxy-4-methylthiobutanamide which is subsequently hydrolyzed within the amide hydrolysis flow reactor to produce 2-hydroxy-4-methylthiobutanoic acid which is then recovered from the aq. hydrolyzate product.

IC ICM C07C319-18  
 ICS C07C323-60; C07C323-52; B01J014-00; A23K001-16

CC 23-16 (Aliphatic Compounds)  
 Section cross-reference(s): 17

IT **7664-93-9, Sulfuric acid**, reactions  
 RL: RCT (Reactant)  
 (concd.; continuous hydrolysis process for prepn. of 2-hydroxy-4-methylthiobutanoic acid or its salts)

IT **583-91-5DP**, 2-Hydroxy-4-methylthiobutanoic acid, salts  
**583-91-5P**, 2-Hydroxy-4-methylthiobutanoic acid  
 RL: IMF (Industrial manufacture); SPN (Synthetic preparation); PREP (Preparation)  
 (continuous hydrolysis process for prepn. of 2-hydroxy-4-methylthiobutanoic acid or its salts)

L8 ANSWER 10 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1996:537082 HCAPLUS  
 DOCUMENT NUMBER: 125:167345

TITLE: Preparation of 2-hydroxy-4-(methylmercapto)butyric acid from acrolein and methyl mercaptan without using **sulfuric acid**

INVENTOR(S): Matsuoka, Kazuyuki  
 PATENT ASSIGNEE(S): Daicel Chem, Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.  
 CODEN: JKXXAF

DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	JP 08157447	A2	19960618	JP 1993-159132	19930629
AB	MeS(CH <sub>2</sub> ) <sub>2</sub> CH(OH)CO <sub>2</sub> H (I), which is used as a feed additive, is prepd. from CH <sub>2</sub> :CHCHO and MeSH, via MeS(CH <sub>2</sub> ) <sub>2</sub> CHO, MeS(CH <sub>2</sub> ) <sub>2</sub> CH(OH)CN (II), MeS(CH <sub>2</sub> ) <sub>2</sub> CH(OH)CONH <sub>2</sub> (III), and esters of MeS(CH <sub>2</sub> ) <sub>2</sub> CH(OH)CO <sub>2</sub> H. Hydration of II in aq. Me <sub>2</sub> CO in the presence of MnO <sub>2</sub> at 60.degree. for 6 h gave				



- 89.0% III, which was autoclaved with MeOH and Pb nitrate at 170.degree. and 20 kg/cm<sup>2</sup> for 5 h with removing NH<sub>3</sub> to afford MeS(CH<sub>2</sub>)<sub>2</sub>CH(OH)CO<sub>2</sub>Me at 83% conversion and 85% selectivity. Hydrolysis of the ester with Amberlyst 15 in H<sub>2</sub>O at 95.degree. for 5 h gave I at 98.8% conversion and 97.1% selectivity.
- IC ICM C07C323-52  
ICS C07C319-18; C07C319-20
- CC 23-17 (Aliphatic Compounds)  
Section cross-reference(s): 17
- IT Feed  
(additive for; prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)
- IT Hydration, chemical  
(hydration of hydroxy(methylmercapto)butyronitrile without using **sulfuric acid** in prepn. of hydroxy(methylmercapto)butyric acid)
- IT 74-90-8P, Prussic acid, preparation  
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation)  
(in prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)
- IT **583-91-5P**, 2-Hydroxy-4-(methylmercapto)butyric acid  
RL: IMF (Industrial manufacture); PREP (Preparation)  
(prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)
- IT 3268-49-3P, 3-(Methylmercapto)propionaldehyde 17773-41-0P, 2-Hydroxy-4-(**methylthio**)butyronitrile  
49540-21-8P, 2-Hydroxy-4-(**methylthio**)butyramide 52703-96-5P  
RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation)  
(prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)
- IT 74-93-1, Methyl mercaptan, reactions 107-02-8, 2-Propenal, reactions  
RL: RCT (Reactant)  
(prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)
- IT 7664-41-7P, Ammonia, preparation  
RL: BYP (Byproduct); RCT (Reactant); PREP (Preparation)  
(recycling of; in prepn. of hydroxy(methylmercapto)butyric acid from acrolein and Me mercaptan without using **sulfuric acid**)

L8 ANSWER 11 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1995:362544 HCAPLUS

DOCUMENT NUMBER: 122:110108

TITLE: Regeneration of **sulfuric acid** from byproduct sulfate from 2-hydroxy-4-(**methylthio**)butyric acid manufacture

INVENTOR(S): Grendel, Robert W.; Klopfenstein, Jeffrey B.; Prokop, Robin K.; Reid, Stanley L.; Willock, James M.

PATENT ASSIGNEE(S): Monsanto Co., USA; Novus International, Inc.

SOURCE: PCT Int. Appl., 46 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9428717	A1	19941222	WO 1993-US10028	19931021
W: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, VN				
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
US 5498790	A	19960312	US 1993-73877	19930609
ZA 9307163	A	19940616	ZA 1993-7163	19930927
AU 9454085	A1	19950103	AU 1994-54085	19931021
BR 9307863	A	19960206	BR 1993-7863	19931021
EP 705060	A1	19960410	EP 1993-924374	19931021
R: BE, DE, ES, FR, GB				
CN 1096766	A	19941228	CN 1993-119580	19931025
US 5670128	A	19970923	US 1996-604410	19960221
PRIORITY APPLN. INFO.:			US 1993-73877	19930609
			WO 1993-US10028	19931021
AB	The process comprises burning the oxidizable components of a feed soln. obtained as byproduct in the manuf. of 2-hydroxy-4-(methylthio)butyric acid (I) by hydrolysis of 2-hydroxy-4-(methylthio)butyronitrile (II). An SO <sub>2</sub> -contg. combustion gas is produced. The combustion gas is cooled to condense H <sub>2</sub> O and H <sub>2</sub> SO <sub>4</sub> , and mixed with an O source to produce a feed gas contg. .gtorsim.0.9 mol oxygen/mol SO <sub>2</sub> . The feed gas is passed over a catalyst to convert the SO <sub>2</sub> into SO <sub>3</sub> , which is absorbed in concd. H <sub>2</sub> SO <sub>4</sub> to generate addnl. sulfuric acid that may be recycled and used in the hydrolysis of II. The process may be operated as a closed system in which NH <sub>4</sub> H <sub>2</sub> SO <sub>4</sub> byproduct of the I manuf. is used as the S source for forming H <sub>2</sub> SO <sub>4</sub> used in the hydrolysis of II to I. Thus process decreases the use of H <sub>2</sub> SO <sub>4</sub> and the vol. of byproducts in the manuf. of I by the hydrolysis of II.			
IC	ICM A01N037-02			
	ICS C01B017-76; C01B017-92			
CC	49-2 (Industrial Inorganic Chemicals)			
	Section cross-reference(s): 23			
ST	<b>sulfuric acid recycling; hydroxy methylthiobutyric acid sulfuric acid; hydroxymethylthiobutyronitrile hydrolysis sulfuric acid ; sulfur dioxide trioxide sulfuric acid</b>			
IT	Combustion Recycling (regeneration of <b>sulfuric acid</b> from byproduct sulfate from 2- <b>hydroxy-4-(methylthio) butyric acid</b> manuf.)			
IT	<b>583-91-5P, 2-Hydroxy-4-(methylthio) butyric acid</b> RL: IMF (Industrial manufacture); PREP (Preparation) (regeneration of <b>sulfuric acid</b> from byproduct sulfate from 2- <b>hydroxy-4-(methylthio) butyric acid</b> manuf.)			
IT	7446-09-5P, Sulfur dioxide, preparation 7446-11-9P, Sulfur trioxide, preparation RL: PNU (Preparation, unclassified); RCT (Reactant); PREP (Preparation) (regeneration of <b>sulfuric acid</b> from byproduct			

sulfate from 2-hydroxy-4-(methylthio)  
butyric acid manuf.)  
IT 7664-93-9P, Sulfuric acid, preparation  
7783-20-2P, Ammonium sulfate, preparation 7803-63-6P, Ammonium  
bisulfate

RL: PUR (Purification or recovery); PREP (Preparation)  
(regeneration of sulfuric acid from byproduct  
sulfate from 2-hydroxy-4-(methylthio)  
butyric acid manuf.)

IT 17773-41-0, 2-Hydroxy-4-(methylthio)

butyronitrile

RL: RCT (Reactant)

(regeneration of sulfuric acid from byproduct  
sulfate from 2-hydroxy-4-(methylthio)  
butyric acid manuf.)

L8 ANSWER 12 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1990:499839 HCAPLUS

DOCUMENT NUMBER: 113:99839

TITLE: Manufacture of 2-hydroxy-4-(  
methylthio)butyric acid aqueous  
solutions

INVENTOR(S): Azagra Hernandez, Javier; Ruiz Moreno, Luis

PATENT ASSIGNEE(S): Sociedad de Desarrollo Tecnico Industrial S. A.,  
Spain

SOURCE: Span., 8 pp.

CODEN: SPXXAD

DOCUMENT TYPE: Patent

LANGUAGE: Spanish

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
ES 2005784	A6	19890316	ES 1988-496	19880222
EP 330527	A1	19890830	EP 1989-400157	19890119
EP 330527	B1	19920923		
R: AT, BE, CH, DE, ES, FR, GB, GR, IT, LI, LU, NL, SE				
AT 80871	E	19921015	AT 1989-400157	19890119
ES 2045478	T3	19940116	ES 1989-400157	19890119
CA 1308419	A1	19921006	CA 1989-590042	19890203
US 4912257	A	19900327	US 1989-309241	19890213
DK 8900788	A	19890822	DK 1989-788	19890221
PRIORITY APPLN. INFO.:			ES 1988-496	19880222
			EP 1989-400157	19890119

AB The DL-methionine analog, useful as a feed additive, is prepd. by  
conversion of MeSCH<sub>2</sub>H<sub>2</sub>CH<sub>2</sub>CHO to the cyanohydrin, followed without  
isolation by hydrolysis with H<sub>2</sub>SO<sub>4</sub>. The hydrolysis product is  
neutralized

with NH<sub>4</sub>OH, which produces two phases, which are sepd. The aq. phase is  
concd. by evapn. of water, filtered or centrifuged to sep. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, and  
the remaining liq. is recycled to the neutralization reactor; the org.  
phase is distd. to remove residual water, filtered to sep. impure  
(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> which is dissolved in water and resolved in water and recycled  
to the neutralization reactor, and the essentially pure desired acid is  
dild. with water and stabilized with a small amt. of H<sub>2</sub>SO<sub>4</sub>. In an  
example

this process gave an 88% aq. soln. of the desired acid.

IC ICM C07C149-20  
ICA A23K001-22  
CC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)  
Section cross-reference(s): 17, 23  
IT 7664-93-9, Sulfuric acid, reactions  
RL: RCT (Reactant)  
(in hydrolysis of hydroxy(methylthio)  
butyrylnitrile)  
IT 583-91-5P, 2-Hydroxy-4-(methylthio)  
butyric acid  
RL: PREP (Preparation)  
(manuf. of, in aq. soln.)  
IT 1336-21-6, Ammonium hydroxide  
RL: RCT (Reactant)  
(neutralization by, of hydrolysis products of hydroxy(  
methylthio)butyronitrile)

L8 ANSWER 13 OF 13 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1986:5569 HCAPLUS  
DOCUMENT NUMBER: 104:5569  
TITLE: Liquid 2-hydroxymethylthiobutyric acid  
INVENTOR(S): Ruest, Dennis Arthur; Takano, Masaharu; Wolf,  
Lawrence  
Russell  
PATENT ASSIGNEE(S): Monsanto Co. , USA  
SOURCE: Eur. Pat. Appl., 51 pp.  
CODEN: EPXXDW  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 142488	A2	19850522	EP 1984-870150	19841113
EP 142488	A3	19850626		
EP 142488	B1	19870826		
R: AT, BE, CH, DE, FR, IT, LI, LU, NL, SE				
US 4524077	A	19850618	US 1983-550857	19831114
AU 8435359	A1	19850523	AU 1984-35359	19841113
AU 562078	B2	19870528		
GB 2149791	A1	19850619	GB 1984-28657	19841113
GB 2149791	B2	19880420		
JP 60156396	A2	19850816	JP 1984-239325	19841113
JP 05001787	B4	19930111		
ZA 8408847	A	19850925	ZA 1984-8847	19841113
AT 29131	E	19870915	AT 1984-870150	19841113
SU 1428193	A3	19880930	SU 1984-3812267	19841113
CA 1263668	A1	19891205	CA 1984-467699	19841113
JP 05211846	A2	19930824	JP 1992-199865	19920727
JP 07097970	B4	19951025		
PRIORITY APPLN. INFO.:			US 1983-550857	19831114
			EP 1984-870150	19841113

AB MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CN (I) is hydrolyzed with 50-70 wt. % H<sub>2</sub>SO<sub>4</sub> to give MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CONH<sub>2</sub>, which is further hydrolyzed with 30-50% H<sub>2</sub>SO<sub>4</sub> to give MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CO<sub>2</sub>H (II). II is recovered by liq.-liq. extn. Thus,

I was treated with 50% H<sub>2</sub>SO<sub>4</sub> at 50.degree. for 1 h, followed by heating at 90.degree. for 100 min, neutralization with NH<sub>3</sub>, and extn. of II with MeCOPr. II had lighter color, less odor, lower viscosity and better thermal stability, compared to II prepd. by std. methods. II is a feed supplement.

IC ICM C07C149-20  
 CC 23-17 (Aliphatic Compounds)  
 Section cross-reference(s): 17, 45  
 IT 106-35-4 108-83-8 110-12-3 110-43-0  
 RL: RCT (Reactant)  
 (extn. by, of **hydroxy(methylthio)butyric acid**)

IT 60-29-7, uses and miscellaneous 71-36-3, uses and miscellaneous  
 71-41-0, uses and miscellaneous 75-09-2, uses and miscellaneous  
 75-65-0, uses and miscellaneous 78-83-1, uses and miscellaneous  
 78-92-2 78-93-3, uses and miscellaneous 79-01-6, uses and miscellaneous  
 RL: USES (Uses)  
 (extn. by, of **hydroxy(methylthio)butyric acid**, distribution coeff. in)

IT 107-87-9 108-10-1 108-20-3 108-21-4 109-60-4 123-72-8  
 123-86-4  
 141-78-6, uses and miscellaneous 1300-21-6 6032-29-7  
 RL: RCT (Reactant)  
 (extn. by, of **hydroxy(methylthio)butyric acid**, distribution coeff. in)

IT **7664-93-9**, reactions  
 RL: RCT (Reactant)  
 (hydrolysis by, of **hydroxy(methylthio)butyronitrile**, in manuf. of hydroxymethylthiobutyric acid)

IT **583-91-5P**  
 RL: PREP (Preparation)  
 (manuf. of, hydrolysis and extn. process for)

L11 ANSWER 1 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 2000:388658 HCAPLUS  
 DOCUMENT NUMBER: 133:16415  
 TITLE: **Manufacture of .alpha.-hydroxy-4-methylthiobutyramide** with Agrobacterium  
 INVENTOR(S): Takashima, Haruki; Inoue, Ayumi  
 PATENT ASSIGNEE(S): Sumitomo Chemical Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 3 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000157293	A2	20000613	JP 1998-330979	19981120
AB	The title compd. (I), useful as an intermediate for .alpha.-hydroxy-4-methylthiobutyric acid as a poultry feed additive, is manufd. by treating			

- .alpha.-hydroxy-4-methylthiobutyronitrile (II) with cultures, cells, or cell preps. of Agrobacterium. Precultured Agrobacterium radiobacter SC-C15-1 was incubated with a phosphate buffer contg. 50 mg II at 30.degree. for 10 min to give 10;3 mg I.
- IC ICM C12P013-02  
ICS C12P013-02; C12R001-01
- CC 16-2 (Fermentation and Bioindustrial Chemistry)
- ST hydroxymethylthiobutyramide manuf Agrobacterium  
hydroxymethylthiobutyronitrile **hydrolysis**; fermn  
hydroxymethylthiobutyramide Agrobacterium
- IT **Hydrolysis**  
(biol.; manuf. of .alpha.-hydroxy-4-methylthiobutyramide from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium)
- IT Agrobacterium  
Agrobacterium tumefaciens  
Fermentation  
(manuf. of .alpha.-hydroxy-4-methylthiobutyramide from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium)
- IT 583-91-5P, .alpha.-Hydroxy-4-methylthiobutyric acid  
RL: PNU (Preparation, unclassified); PREP (Preparation)  
(intermediate for; manuf. of .alpha.-hydroxy-4-methylthiobutyramide from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium)
- IT 49540-21-8P  
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)  
(manuf. of .alpha.-hydroxy-4-methylthiobutyramide from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium)
- IT 17773-41-0, .alpha.-Hydroxy-4-methylthiobutyronitrile  
RL: BPR (Biological process); RCT (Reactant); BIOL (Biological study); PROC (Process)  
(manuf. of .alpha.-hydroxy-4-methylthiobutyramide from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium)

L11 ANSWER 2 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 2000:376527 HCAPLUS

DOCUMENT NUMBER: 132:346724

TITLE: **Manufacture of .alpha.-hydroxy-4-methylthiobutyric acid from .alpha.-hydroxy-4-methylthiobutyronitrile**  
with Agrobacterium species

INVENTOR(S): Takashima, Yoshiki; Inoue, Ayumu

PATENT ASSIGNEE(S): Sumitomo Chemical Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2000152800 A2 20000606 JP 1998-328034 19981118  
 AB .alpha.-Hydroxy-4-methylthiobutyric acid (I), already know as an feed additive, is manufd. by treatment of .alpha.-hydroxy-4-methylthiobutyronitrile (II) with fermn. broth, cell, or preps. of Agrobacterium sp. capable of converting II into I. Manuf. of I with A. radiobacter SC-C15-1 strain is exemplified.  
 IC ICM C12P007-42  
 ICS A23K001-16; C12N001-20; C12P007-42; C12R001-01  
 CC 16-5 (Fermentation and Bioindustrial Chemistry)  
 Section cross-reference(s): 18  
 IT **Hydrolysis**  
 (biol.; manuf. of .alpha.-hydroxy-4-methylthiobutyric acid from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium sp.)  
 IT Agrobacterium  
 Agrobacterium tumefaciens  
 Feed additives  
 Fermentation  
 (manuf. of .alpha.-hydroxy-4-methylthiobutyric acid from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium sp.)  
 IT 583-91-5P, .alpha.-Hydroxy-4-methylthiobutyric acid  
 RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)  
 (manuf. of .alpha.-hydroxy-4-methylthiobutyric acid from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium sp.)  
 IT 17773-41-0, .alpha.-Hydroxy-4-methylthiobutyronitrile  
 RL: BPR (Biological process); RCT (Reactant); BIOL (Biological study); PROC (Process)  
 (manuf. of .alpha.-hydroxy-4-methylthiobutyric acid from .alpha.-hydroxy-4-methylthiobutyronitrile with Agrobacterium sp.)

L11 ANSWER 3 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 2000:300361 HCAPLUS  
 DOCUMENT NUMBER: 132:292814  
 TITLE: Enzymic manufacture of ammonium .alpha.-hydroxycarboxylates from .alpha.-hydroxynitriles  
 INVENTOR(S): Kobayashi, Yoichi; Hayakawa, Kimiichi  
 PATENT ASSIGNEE(S): Nippon Soda Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000125891	A2	20000509	JP 1998-295646	19981016

OTHER SOURCE(S): MARPAT 132:292814  
 AB HOCHRCO<sub>2</sub>-NH<sub>4</sub><sup>+</sup> [R = H, (un)substituted C1-6 alkyl, (un)substituted C2-6 alkenyl, (un)substituted C1-6 alkoxy, (un)substituted aryl, (un)substituted aryloxy, (un)substituted heterocyclyl] are manufd. by hydrolysis of HOCHRCN (R = same as above) with microbial enzymes in such

way that the concn. of the .alpha.-hydroxynitriles in the reaction mixts. is reduced by two steps. 2-Hydroxy-4-methylthiobutyronitrile was treated with Arthrobacter sp. NSSC104 in water with controlling the concn. of the nitrile at 0.3 wt.% in the 1st and 2nd reactors, and at .ltoreq.0.03 wt.% in the 3rd reactor to manuf. 98% ammonium

2-hydroxy-4-methylthiobutanoate.

IC ICM C12P007-42  
ICS C12P013-00; C12P007-42; C12R001-06  
CC 16-5 (Fermentation and Bioindustrial Chemistry)  
ST ammonium hydroxycarboxylate manuf Arthrobacter; alpha hydroxynitrile  
**hydrolysis** Arthrobacter  
IT **Hydrolysis**  
(enzymic; enzymic manuf. of ammonium .alpha.-hydroxycarboxylates from .alpha.-hydroxynitriles)  
IT 17773-41-0, 2-**Hydroxy-4-methylthiobutyronitrile**  
RL: BPR (Biological process); RCT (Reactant); BIOL (Biological study); PROC (Process)  
(enzymic **manuf.** of ammonium .alpha.-hydroxycarboxylates from .alpha.-hydroxynitriles)

L11 ANSWER 4 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1999:419193 HCAPLUS

DOCUMENT NUMBER: 131:102541

TITLE: Preparation of methionine and its hydroxy analog via acid **hydrolysis** of alkaline methioninates using cationic carboxylic or sulfonic resins

INVENTOR(S): Gros, Georges; Casse, Claude; Ponceblanc, Herve; Horbez, Dominique

PATENT ASSIGNEE(S): Rhone Poulenc Nutrition Animale, Fr.

SOURCE: Fr. Demande, 37 pp.

CODEN: FRXXBL

DOCUMENT TYPE: Patent

LANGUAGE: French

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	FR 2772026	A1	19990611	FR 1997-15374	19971205
AB	Acidification of alk. methioninates using carboxylic and sulfonic resins gave after purifn. methionine and its hydroxy analog. Thus, acid hydrolysis of sodium methioninate using carboxylic resin IRC50 gave methionine.				
IC	ICM C07C323-52				
CC	34-2 (Amino Acids, Peptides, and Proteins)				
ST	resin carboxylic sulfonic acidification methioninate prepn; methionine prepn purifn acid <b>hydrolysis</b> methioninate				
IT	<b>Hydrolysis</b> (acid; prepn. of methionine and its hydroxy analog via acid <b>hydrolysis</b> of alk. methioninates using cationic carboxylic or sulfonic resins)				
IT	583-91-5P		3198-47-8P		
	RL: IMF (Industrial manufacture); PUR (Purification or recovery); SPN (Synthetic preparation); PREP (Preparation) (prepn. of methionine and its hydroxy analog via acid <b>hydrolysis</b> of alk. methioninates using cationic carboxylic or sulfonic resins)				



IT 19298-72-7P 41442-22-2P 83332-11-0P  
 RL: IMF (Industrial manufacture); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation)  
 (prepn. of methionine and its hydroxy analog via acid  
**hydrolysis** of alk. methioninates using cationic carboxylic or sulfonic resins)

IT 9002-29-3, IRC50 9037-24-5, Amberlyst 15 17773-41-0 63302-72-7  
 64093-65-8, Duolite c 464 64176-50-7, IMAC c 16p 120562-88-1  
 RL: RCT (Reactant)  
 (prepn. of methionine and its hydroxy analog via acid  
**hydrolysis** of alk. methioninates using cationic carboxylic or sulfonic resins)

L11 ANSWER 5 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1998:430313 HCAPLUS  
 DOCUMENT NUMBER: 129:121724  
 TITLE: Manufacture of carboxylic acids with nitrile-hydrating microorganisms or their preparations  
 INVENTOR(S): Matsuoka, Kazuyuki; Matsuyama, Akikazu  
 PATENT ASSIGNEE(S): Daicel Chemical Industries, Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 21 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 10179183	A2	19980707	JP 1996-341673	19961220
EP 852261	A2	19980708	EP 1997-122301	19971217
EP 852261	A3	19991201		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
US 5932454	A	19990803	US 1997-992545	19971217
CN 1186061	A	19980701	CN 1997-109375	19971220
			JP 1996-341673	19961220

PRIORITY APPLN. INFO.:  
 OTHER SOURCE(S): MARPAT 129:121724

AB Carboxylic acids are manufd. by (1) treatment of nitriles (e.g. cyanohydrins) with nitrile-hydrating microorganisms or their prepsns. to (a) produce (hydroxy)amides which are hydrolyzed in the presence of bases to give (hydroxy)carboxylic acid salts or (b) produce (hydroxy)carboxylic acid salts and (2) electrodialysis of the resulting carboxylic acid salts to give corresponding carboxylic acids and bases (e.g. NH<sub>3</sub>). Bipolar membranes, cation-exchange membranes, or anion-exchange membranes may be used in the electrodialysis process and NH<sub>3</sub> generated in the carboxylic acid salt-producing and/or electrodialysis processes may be collected and recycled as a N source in prodn. of nitriles (e.g. HCN). Byproducts such as NH<sub>4</sub>HSO<sub>4</sub> are not generated and NH<sub>3</sub> is easily collected and recycled in the process. 2-Hydroxy-4-methylthiobutanenitrile was treated with

Gordona

rubroperitinctus JCM 3204 to give 83% 2-hydroxy-4-methylthiobutanamide and 17% 2-hydroxy-4-methylthiobutanoic acid (I) ammonium salt. Then, extn. with MEK and hydrolysis of the amide above to give I Na salt and NH<sub>3</sub>, NH<sub>3</sub> recovery from the mixt., electrodialysis of the I Na salt soln. using a bipolar membrane and cation-exchange membrane, and extn. with MEK and

purifn. gave I. NH3 generated and MEK used in the process were recycled.

IC ICM C12P007-40  
ICS C12P013-02; C12P007-40; C12R001-01

CC 16-5 (Fermentation and Bioindustrial Chemistry)

ST nitrile **hydrolysis** carboxylic acid manuf microorganism;  
cyanohydrin **hydrolysis** hydroxycarboxylic acid manuf  
microorganism; hydroxymethylthiobutanoic acid manuf Gordona nitrile  
**hydrolysis**; electrodialysis hydroxycarboxylic acid manuf  
microorganism; ammonia recovery hydroxycarboxylic acid manuf  
microorganism

IT **583-91-5P**, 2-Hydroxy-4-methylthiobutanoic acid  
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); PUR  
(Purification or recovery); BIOL (Biological study); PREP (Preparation)  
(nitrile (cyanohydrin) hydration with microorganisms, electrodialysis,  
and NH3 recovery as N source in manuf. of (hydroxy)carboxylic acids)

L11 ANSWER 6 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1998:293633 HCAPLUS

DOCUMENT NUMBER: 129:3902

TITLE: **Manufacture of 2-hydroxy 4-**

**methylthiobutyric** acid from the nitrile using  
an immobilized nitrilase-producing microorganism

INVENTOR(S): Favre-Bulle, Olivier; Pierrard, Jerome; David,  
Christophe; Morel, Philippe; Horbez, Dominique

PATENT ASSIGNEE(S): Rhone-Poulenc Nutrition Animale, Fr.

SOURCE: PCT Int. Appl., 61 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: French

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9818941	A1	19980507	WO 1997-FR1913	19971024
W:	AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, GH, HU, ID, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, SL, TR, TT, UA, UZ, VN, YU, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM			
RW:	GH, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG			
FR 2755143	A1	19980430	FR 1996-13077	19961025
FR 2755143	B1	19981127		
AU 9749513	A1	19980522	AU 1997-49513	19971024
EP 934419	A1	19990811	EP 1997-912254	19971024
R:	AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, PT, IE,			
FI				
BR 9712558	A	19991019	BR 1997-12558	19971024
CN 1234074	A	19991103	CN 1997-199025	19971024
PRIORITY APPLN. INFO.:			FR 1996-13077	19961025
			WO 1997-FR1913	19971024

AB A method of prep. 2-hydroxy 4-methylthio butyric acid or its ammonium salt by enzymic hydrolysis of 2-hydroxy 4-methylthiobutyronitrile is described. The method uses a nitrilase-producing microorganism immobilized on a suitable carrier to carry out the hydrolysis. The microorganism may be a transgenic one expressing a cloned gene for a

nitrilase. The free acid or the ammonium salt may be obtained. The nitrilase of *Alcaligenes faecalis* was purified and partially characterized

and the gene encoding it cloned by PCR with sequence-derived primers. The

gene was expressed in *Escherichia coli* using prior art expression vectors.

Increasing the level of expression of the *groE* gene increased the yield of nitrilase activity.

IC ICM C12N015-55

ICS C12P011-00; C12M001-40

CC 16-2 (Fermentation and Bioindustrial Chemistry)

IT Genes (microbial)

RL: BSU (Biological study, unclassified); BIOL (Biological study) (cpsB, promoter of, in nitrilase expression vector for

*Corynebacterium*;

**manuf. of 2-hydroxy 4-methylthiobutyric**

acid from nitrile using immobilized nitrilase-producing microorganism)

IT Aspergillus

Bacillus (bacterium genus)

*Corynebacterium*

*Corynebacterium glutamicum*

*Escherichia coli*

*Kluyveromyces*

*Penicillium*

*Pseudomonas putida*

*Saccharomyces*

*Streptomyces*

*Streptomyces lividans*

(expression host; **manuf. of 2-hydroxy 4-**

**methylthiobutyric** acid from nitrile using immobilized nitrilase-producing microorganism)

IT Genes (microbial)

RL: BUU (Biological use, unclassified); BIOL (Biological study); USES (Uses)

(*groE*, in improving stability of *Alcaligenes* nitrilase in *Escherichia coli*; **manuf. of 2-hydroxy 4-**

**methylthiobutyric** acid from nitrile using immobilized nitrilase-producing microorganism)

IT Ion exchangers

(immobilization of nitrilase bearing cells on; **manuf. of 2-**

**hydroxy 4-methylthiobutyric** acid from nitrile using immobilized nitrilase-producing microorganism)

IT Diatomite

Glutens

Polyamides, uses

Polysaccharides, uses

Zeolites (synthetic), uses

RL: DEV (Device component use); USES (Uses)

(immobilization of nitrilase bearing cells on; **manuf. of 2-**

**hydroxy 4-methylthiobutyric** acid from nitrile using immobilized nitrilase-producing microorganism)

IT Aldehydes, uses

Amines, uses

Carboxylic acids, uses

RL: DEV (Device component use); USES (Uses)

- (in immobilization of nitrilase bearing cells; **manuf.** of 2-**hydroxy 4-methylthiobutyric** acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Electrodialysis  
(in purifn. of 2-**hydroxy 4-methylthiobutyric** acid;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Proteins (specific proteins and subclasses)  
RL: DEV (Device component use); USES (Uses)  
(insol., immobilization of nitrilase bearing cells on; **manuf.**  
of 2-**hydroxy 4-methylthiobutyric** acid from nitrile  
using immobilized nitrilase-producing microorganism)
- IT Immobilization (biological cell)  
(microbial cell, of nitrilase-bearing cells; **manuf.** of 2-**hydroxy 4-methylthiobutyric** acid from nitrile using  
immobilized nitrilase-producing microorganism)
- IT Genes (microbial)  
RL: BSU (Biological study, unclassified); BUU (Biological use,  
unclassified); PRP (Properties); BIOL (Biological study); USES (Uses)  
(nitB, for nitrilase of *Alcaligenes faecalis*, cloning and expression  
of; **manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT *Alcaligenes faecalis*  
*Comamonas testosteroni*  
(nitrilase of; **manuf.** of 2-**hydroxy 4-**  
**methylthiobutyric** acid from nitrile using immobilized  
nitrilase-producing microorganism)
- IT Enzymic hydrolysis  
(of nitriles; **manuf.** of 2-**hydroxy 4-**  
**methylthiobutyric** acid from nitrile using immobilized  
nitrilase-producing microorganism)
- IT Plasmid vectors  
(pCGL1087, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pCGL482, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pOS48.7, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT12, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT13, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT14, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf.** of 2-**hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT23, expression vector for *Alcaligenes faecalis* nitB gene;

- manuf. of 2-hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT24, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf. of 2-hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT37, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf. of 2-hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Plasmid vectors  
(pRPA-BCAT76, expression vector for *Alcaligenes faecalis* nitB gene;  
**manuf. of 2-hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT Isocyanates  
RL: DEV (Device component use); USES (Uses)  
(polymeric, immobilization of nitrilase bearing cells on; **manuf.**  
of **2-hydroxy 4-methylthiobutyric** acid from  
nitrile using immobilized nitrilase-producing microorganism)
- IT GroEL (chaperonin)  
GroES (chaperonin)  
RL: BUU (Biological use, unclassified); BIOL (Biological study); USES  
(Uses)  
(stabilization of nitrilase using; **manuf. of 2-**  
**hydroxy 4-methylthiobutyric** acid from nitrile using  
immobilized nitrilase-producing microorganism)
- IT 7440-44-0, Carbon, uses  
RL: DEV (Device component use); USES (Uses)  
(activated, immobilization of nitrilase bearing cells on; **manuf.**  
of **2-hydroxy 4-methylthiobutyric** acid from  
nitrile using immobilized nitrilase-producing microorganism)
- IT 17773-41-0, 2-Hydroxy 4-methylthio  
**butyronitrile**  
RL: RCT (Reactant)  
(enzymic **hydrolysis** to acid of; **manuf. of 2-**  
**hydroxy 4-methylthiobutyric** acid from nitrile using  
immobilized nitrilase-producing microorganism)
- IT 9002-98-6 9005-32-7, Alginic acid 11114-20-8, .kappa. Carrageenan  
25212-19-5, Kymene 557 53860-05-2, Polyazetidine  
RL: DEV (Device component use); USES (Uses)  
(immobilization of nitrilase bearing cells on; **manuf. of 2-**  
**hydroxy 4-methylthiobutyric** acid from nitrile using  
immobilized nitrilase-producing microorganism)
- IT 1344-28-1, Alumina, uses  
RL: DEV (Device component use); USES (Uses)  
(immobilization of nitrilase bearing cells; **manuf. of 2-**  
**hydroxy 4-methylthiobutyric** acid from nitrile using  
immobilized nitrilase-producing microorganism)
- IT **583-91-5P, 2-Hydroxy 4-methylthiobutyric** acid  
63302-72-7P  
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); BIOL  
(Biological study); PREP (Preparation)  
(**manuf. of 2-hydroxy 4-methylthiobutyric**  
acid from nitrile using immobilized nitrilase-producing microorganism)
- IT 9024-90-2DP, Nitrilase, immobilized  
RL: BPN (Biosynthetic preparation); CAT (Catalyst use); BIOL (Biological  
study); PREP (Preparation); USES (Uses)

(manuf. of 2-hydroxy 4-methylthiobutyric  
acid from nitrile using immobilized nitrilase-producing microorganism)

L11 ANSWER 7 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1998:8630 HCAPLUS

DOCUMENT NUMBER: 128:88585

TITLE: Preparation of carboxylic acids by **hydrolysis**  
of carboxamides

INVENTOR(S): Kawabe, Masato; Yamamoto, Kenichi; Pan, Lirui

PATENT ASSIGNEE(S): Daicel Chemical Industries, Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 3 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09328448	A2	19971222	JP 1996-145439	19960607

OTHER SOURCE(S): CASREACT 128:88585

AB Carboxylic acids are prepd. by hydrolysis of carboxamides in the presence of carboxylic acids, preferably having pKa .ltoreq.4.5. Carboxylic acid ammonium salts formed in the reaction are also industrially important compds. A mixt. of lactamide, formic acid, and H2O was autoclaved at 150.degree. for 2 h to give 96% lactic acid, vs. 3.5% for a control reaction using no formic acid.

IC ICM C07C051-06  
ICS B01J031-04; C07B041-08; C07C053-122; C07C059-08; C07C319-12; C07C323-52; C07B061-00

CC 23-16 (Aliphatic Compounds)

ST carboxylic acid prepn carboxamide **hydrolysis**; amide **hydrolysis** carboxylic acid prepn

IT **Hydrolysis**  
(prepn. of carboxylic acids by **hydrolysis** of carboxamides using acid dissocn. const.-controlled carboxylic acids)

IT Carboxylic acids, preparation  
RL: IMF (Industrial manufacture); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation)  
(prepn. of carboxylic acids by **hydrolysis** of carboxamides using acid dissocn. const.-controlled carboxylic acids)

IT Amides, reactions  
RL: RCT (Reactant)  
(prepn. of carboxylic acids by **hydrolysis** of carboxamides using acid dissocn. const.-controlled carboxylic acids)

IT 540-69-2P, Ammonium formate  
RL: BYP (Byproduct); PREP (Preparation)  
(byproduct; prepn. of carboxylic acids by **hydrolysis** of carboxamides using acid dissocn. const.-controlled carboxylic acids)

IT 50-21-5P, Lactic acid, preparation 79-09-4P, Propionic acid, preparation  
**583-91-5P**  
RL: IMF (Industrial manufacture); SPN (Synthetic preparation); PREP (Preparation)  
(prepn. of carboxylic acids by **hydrolysis** of carboxamides using acid dissocn. const.-controlled carboxylic acids)

IT 64-18-6, Formic acid, reactions 79-05-0, Propionamide 2043-43-8,

Lactamide 49540-21-8

RL: RCT (Reactant)

(prepn. of carboxylic acids by **hydrolysis** of carboxamides  
using acid dissocn. const.-controlled carboxylic acids)

L11 ANSWER 8 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1996:605568 HCAPLUS

DOCUMENT NUMBER: 125:247216

TITLE: Preparation of carboxylic acids

INVENTOR(S): Kawabe, Masato; Yamamoto, Kenichi; Matsuoka, Kazuyuki

PATENT ASSIGNEE(S): Daicel Chemical Industries, Ltd., Japan

SOURCE: Eur. Pat. Appl., 21 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 731079	A2	19960911	EP 1996-103576	19960307
EP 731079	A3	19961016		
EP 731079	B1	20000614		
R: DE, FR				
JP 08245495	A2	19960924	JP 1995-78211	19950308
US 5763652	A	19980609	US 1996-611877	19960306
CN 1138020	A	19961218	CN 1996-104051	19960308
JP 09067296	A2	19970311	JP 1996-155522	19960617
PRIORITY APPLN. INFO.:			JP 1995-78211	19950308
			JP 1995-181075	19950622

OTHER SOURCE(S): MARPAT 125:247216

AB The title process comprises hydrolysis of a nitrile or an amide in the presence of an inorg. acid or other acidic catalyst or an alkali metal hydroxide or other basic catalyst and the byproduct ammonium salt of the acidic catalyst or the product carboxylic acid salt and a base is electrodialysed to form an acid and NH<sub>3</sub> or aq. NH<sub>3</sub> or to form a base and NH<sub>3</sub>. The obtained acid or base may be recycled as a catalyst for the hydrolysis of the nitrile compd. or amide compd. and the obtained ammonia is reutilized as a nitrogen source for the nitrile compd. or amide compd.

IC ICM C07C051-08

ICS C07C051-06; C07C051-02

CC 23-16 (Aliphatic Compounds)

ST carboxylic acid; nitrile amide **hydrolysis**

IT 50-21-5P, Lactic acid, preparation 79-31-2P, Isobutyric acid

**583-91-5P**, 2-Hydroxy-4-(methylthio)butanoic acid

RL: IMF (Industrial manufacture); SPN (Synthetic preparation); PREP (Preparation)

(prepn. of carboxylic acids)

L11 ANSWER 9 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1996:350373 HCAPLUS

DOCUMENT NUMBER: 125:8682

TITLE: Enzymic **hydrolysis** of 4-methylthiobutyronitriles

INVENTOR(S): Favre-Bulle, Olivier; Bontoux, Marie-Claude; Largeau, Denis; Ariagno, Andre

PATENT ASSIGNEE(S): Rhone-Poulenc Nutrition Animale, Fr.

SOURCE: PCT Int. Appl., 26 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: French  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9609403	A1	19960328	WO 1995-FR1196	19950919
W: AM, AU, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KG, KP, KR, KZ, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TT, UA, US, UZ, VN				
RW: KE, MW, SD, SZ, UG, AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
FR 2724931	A1	19960329	FR 1994-11301	19940922
FR 2724931	B1	19961220		
FR 2731438	A1	19960913	FR 1995-2615	19950307
FR 2731438	B1	19970516		
CA 2200100	AA	19960328	CA 1995-2200100	19950919
AU 9534764	A1	19960409	AU 1995-34764	19950919
AU 699625	B2	19981210		
EP 782629	A1	19970709	EP 1995-931259	19950919
EP 782629	B1	19981202		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, NL, PT, SE				
CN 1158640	A	19970903	CN 1995-195224	19950919
BR 9509176	A	19971223	BR 1995-9176	19950919
HU 77079	A2	19980302	HU 1997-2057	19950919
JP 10507631	T2	19980728	JP 1995-510644	19950919
AT 174059	E	19981215	AT 1995-931259	19950919
ES 2126313	T3	19990316	ES 1995-931259	19950919
US 5814497	A	19980929	US 1997-809184	19970320
FI 9701198	A	19970321	FI 1997-1198	19970321
PRIORITY APPLN. INFO..:				
			FR 1994-11301	19940922
			FR 1995-2615	19950307
			WO 1995-FR1196	19950919
AB	A novel method for the enzymic hydrolysis of 4-methylthiobutyronitriles to			
	racemic 4-methylthiobutyric acid derivs. using a nitrilase of <i>Alcaligenes faecalis</i> , <i>Rhodococcus</i> sp. HT 29-7 or <i>Gordona terrae</i> is claimed.			
IC	ICM C12P011-00			
ICI	C12P011-00, C12R001-01, C12R001-05			
CC	16-1 (Fermentation and Bioindustrial Chemistry)			
ST	nitrile nitrilase <b>hydrolysis</b>			
IT	Carboxylic acids, preparation			
	RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)			
	(hydrolysis of 4-methylthiobutyronitrile derivs. with nitrilase)			
IT	Nitriles, biological studies			
	RL: BPR (Biological process); RCT (Reactant); BIOL (Biological study); PROC (Process)			
	(hydrolysis of 4-methylthiobutyronitrile derivs. with nitrilase)			
IT	<i>Alcaligenes faecalis</i>			
	<i>Gordona terrae</i>			



- Rhodococcus  
(**hydrolysis** of 4-methylthiobutyronitrile derivs. with nitrilase from)
- IT 583-91-5P, 2-Hydroxy-4-methylthiobutanoic acid  
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); BIOL (Biological study); PREP (Preparation)  
(**hydrolysis** of 4-methylthiobutyronitrile derivs. with nitrilase)
- IT 17773-41-0, 2-Hydroxy-4-methylthiobutyronitrile  
RL: BPR (Biological process); RCT (Reactant); BIOL (Biological study); PROC (Process)  
(**hydrolysis** of 4-methylthiobutyronitrile derivs. with nitrilase)
- IT 82391-37-5  
RL: CAT (Catalyst use); USES (Uses)  
(**hydrolysis** of 4-methylthiobutyronitrile derivs. with nitrilase)

L11 ANSWER 10 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
ACCESSION NUMBER: 1995:541542 HCAPLUS  
DOCUMENT NUMBER: 123:227635  
TITLE: Manufacture of 2-hydroxymethylmercaptobutyric acid  
INVENTOR(S): Matsuoka, Kazuyuki; Han, Ritsuzui  
PATENT ASSIGNEE(S): Daicel Chem, Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 3 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	JP 07041462	A2	19950210	JP 1993-185903	19930728

OTHER SOURCE(S): CASREACT 123:227635

AB Title compd. (I), useful for feed, is manufd. by hydrolysis of its amide in liq. phase in the presence of heteropoly acids or their salts without formation of byproduct ammonium sulfate. Thus, autoclaving amide of I, H<sub>2</sub>O, and NH<sub>4</sub> cesiummolybdophosphate at 135.degree. for 2.5 h gave 92% I.

IC ICM C07C323-52  
ICS B01J027-19; B01J027-199; C07C319-20

ICA C07B061-00

CC 23-16 (Aliphatic Compounds)

ST hydroxymethylmercaptobutyric acid prepn; **hydrolysis**  
hydroxymethylmercaptobutyramide heteropoly acid catalyst

IT Heteropoly acids  
RL: CAT (Catalyst use); USES (Uses).  
(ammonium cesiummolybdophosphate; catalysts for **hydrolysis** of hydroxymethylmercaptobutyramide)

IT Heteropoly acids  
RL: CAT (Catalyst use); USES (Uses)  
(catalysts for **hydrolysis** of hydroxymethylmercaptobutyramide)

IT **Hydrolysis** catalysts  
(heteropoly acids for hydroxymethylmercaptobutyramide to hydroxymethylmercaptobutyric acid)

IT **Hydrolysis**  
(of hydroxymethylmercaptobutyramide to hydroxymethylmercaptobutyric

acid)  
 IT 58968-02-8 167943-94-4 167943-95-5  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalysts for **hydrolysis** of hydroxymethylmercaptobutyramide)  
 IT 49540-21-8  
 RL: RCT (Reactant)  
 (**hydrolysis** in presence of heteropoly acids)  
 IT 583-91-5P  
 RL: IMF (Industrial manufacture); PREP (Preparation)  
 (prepn. by **hydrolysis** of hydroxymethylmercaptobutyramide in  
 presence of heteropoly acids)

L11 ANSWER 11 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1992:254075 HCAPLUS

DOCUMENT NUMBER: 116:254075

TITLE: Fermentative manufacture of .alpha.-  
**hydroxy-4-methylthiobutyric acid**

INVENTOR(S): Endo, Ryuichi; Tamura, Koji; Yamagami, Tomohide;  
 Kobayashi, Etsuko

PATENT ASSIGNEE(S): Nitto Chemical Industry Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	JP 04040898	A2	19920212	JP 1990-148723	19900608
AB	.alpha.-Hydroxy-4-methylthiobutyric acid (I), useful as a feed additive, is manufd. by fermentative hydrolysis of .alpha.-hydroxy-4-methylthiobutyronitrile (II). Caseobacter sp. BC23 (FERM P-11261) was aerobically cultured in an agar medium contg. glycerol, yeast ext., 0.02% benzonitrile, and salts at 30.degree. and pH 7.5 for 48 h. The bacteria were collected by centrifugation and washed, then treated with a phosphate buffer (pH 7.5) contg. 100 mM II at 25.degree. for 20 h to manuf. 51 mM				
I.	The bacteria were also characterized.				
IC	ICM C12P011-00				
ICI	C12P011-00, C12R001-01; C12P011-00, C12R001-38; C12P011-00, C12R001-05; C12P011-00, C12R001-15; C12P011-00, C12R001-13; C12P011-00, C12R001-365; C12P011-00, C12R001-06				
CC	16-5 (Fermentation and Bioindustrial Chemistry) Section cross-reference(s): 17				
ST	hydroxymethylthiobutyrate manuf fermn; hydroxymethylthiobutyronitrile <b>hydrolysis</b> bacteria				
IT	Alcaligenes Arthrobacter Brevibacterium Brevibacterium acetylicum Caseobacter Corynebacterium Corynebacterium nitrilophilus Nocardia Pseudomonas				

Rhodococcus  
 (hydroxy(methylthio)butyric acid  
 manuf. with, from hydroxy(methylthio)  
 butyronitrile)

IT **Hydrolysis**  
 (biochem., of hydroxy(methylthio)butyronitrile, with bacteria)

IT 17773-41-0, .alpha.-Hydroxy-4-methylthiobutyronitrile  
 RL: RCT (Reactant)  
 (hydrolysis of, with bacteria)

IT 583-91-5P, .alpha.-Hydroxy-4-methylthiobutyric  
 acid  
 RL: BMF (Bioindustrial manufacture); BIOL (Biological study); PREP  
 (Preparation)  
 (manuf. of, by fermn., from hydroxy(  
 methylthio)butyronitrile)

L11 ANSWER 12 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 1989:533627 HCAPLUS  
 DOCUMENT NUMBER: 111:133627  
 TITLE: Hydration of cyanohydrins in weakly alkaline  
 solutions  
 of boric acid salts  
 AUTHOR(S): Jammot, Jacqueline; Pascal, Robert; Commeyras,  
 Auguste  
 CORPORATE SOURCE: Univ. Sci. Tech. Languedoc, Montpellier, 34060, Fr.  
 SOURCE: Tetrahedron Lett. (1989), 30(5), 563-4  
 CODEN: TELEXY; ISSN: 0040-4039

DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 OTHER SOURCE(S): CASREACT 111:133627

AB .alpha.-Hydroxy amides and .alpha.-hydroxy acids were prepd. in  
 satisfactory yield by heating aldehyde-derived cyanohydrins in aq. soln.  
 in the presence of borax or alk. borates. Thus, MeS(CH<sub>2</sub>)<sub>2</sub>CH(OH)CN was  
 treated with aq. borax and KCN to give 83% MeS(CH<sub>2</sub>)CH(OH)CONH<sub>2</sub>. Addn. of  
 excess NaOH to the above reaction mixt. after hydrolysis and then  
 refluxing for 3 h gave 90% MeS(CH<sub>2</sub>)<sub>2</sub>CH(OH)CO<sub>2</sub>H.

CC 23-18 (Aliphatic Compounds)

ST **hydrolysis** cyanohydrin alk borate catalyzed; hydroxy amide; acid  
 hydroxy

IT Cyanohydrins  
 RL: RCT (Reactant)  
 (hydrolysis of, in presence of sodium and potassium borates,  
 hydroxy amides from)

IT **Hydrolysis**  
 (of cyanohydrins in presence of sodium and potassium borates, hydroxy  
 amides from)

IT **Hydrolysis** catalysts  
 (sodium and potassium borates, for cyanohydrins)

IT Amides, preparation  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (hydroxy, prepn. of, by borate-catalyzed **hydrolysis** of  
 cyanohydrins)

IT 1303-96-4, Borax 1332-77-0, Boron potassium oxide (B4K2O7)  
 RL: CAT (Catalyst use); USES (Uses)  
 (catalyst, for **hydrolysis** of cyanohydrins)

IT 1330-43-4, Boron sodium oxide (B4Na2O7)  
 RL: CAT (Catalyst use); USES (Uses)

- (catalysts, for **hydrolysis** of hydroxyacetonitrile)
- IT 79-14-1P, Hydroxyacetic acid, preparation  
 RL: FORM (Formation, nonpreparative); PREP (Preparation)  
 (formation of, in borate-catalyzed **hydrolysis** of hydroxyacetonitrile)
- IT 78-97-7, 2-Hydroxypropionitrile  
 RL: RCT (Reactant)  
 (**hydrolysis** of, in presence of alk. borates)
- IT 75-86-5, 2-Hydroxyisobutyronitrile 532-28-5, .alpha.-Cyanobenzyl alcohol  
 17773-41-0, 2-Hydroxy-4-(methylthio)butyronitrile  
 RL: RCT (Reactant)  
 (**hydrolysis** of, in presence of borate, hydroxy amide from)
- IT 107-16-4, Hydroxyacetonitrile 66471-52-1  
 RL: RCT (Reactant)  
 (**hydrolysis** of, in presence of sodium borate, hydroxy imide from)
- IT 583-91-5P, 2-Hydroxy-4-(methylthio)butyric acid 1113-67-3P 2043-43-8P, 2-Hydroxypropionamide  
 4410-31-5P, 2-Hydroxy-2-phenylacetamide 28870-09-9P 49540-21-8P, 2-Hydroxy-4-(methylthio)butyramide  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (prepn. of)
- IT 90-64-2P, Mandelic acid 598-42-5P  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (prepn. of, via borate-catalyzed **hydrolysis** of cyanohydrin)

L11 ANSWER 13 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
 ACCESSION NUMBER: 1986:5570 HCAPLUS  
 DOCUMENT NUMBER: 104:5570  
 TITLE: Liquid 2-hydroxymethylthiobutyric acid  
 INVENTOR(S): Ruest, Dennis Arthur; Takano, Masaharu; Wolf, Lawrence  
 Russell  
 PATENT ASSIGNEE(S): Monsanto Co. , USA  
 SOURCE: Eur. Pat. Appl., 53 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 143100	A2	19850529	EP 1984-870151	19841113
EP 143100	A3	19850626		
EP 143100	B1	19870805		
R: AT, BE, CH, DE, FR, GB, IT, LI, LU, NL, SE				
JP 60166661	A2	19850829	JP 1984-239324	19841113
JP 04030948	B4	19920525		
AT 28747	E	19870815	AT 1984-870151	19841113
CA 1269995	A1	19900605	CA 1984-467698	19841113
CN 85101573	A	19870110	CN 1985-101573	19850401
PRIORITY APPLN. INFO.:			US 1983-551231	19831114
			EP 1984-870151	19841113

AB MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CN (I) is hydrolyzed with a mineral acid to give MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CO<sub>2</sub>H (II) which is sepd. by extn., using a solvent at

60-200.degree.. II can be recovered from the ext. by steam distn. There is no sepn. of solids from the hydrolyzate. The extn. conditions are controlled so that the ext. and the aq. raffinate are the only liq.

phases

formed upon phase sepn. following extn. Thus, I was heated with 50% H2SO4

at 50.degree., for 1 h, and subsequently at 90.degree. for 100 min. The hydrolyzate was neutralized with NH3 and extd. with MeCOPr to give II, usable as feed additive.

IC ICM C07C149-20

CC 23-17 (Aliphatic Compounds)

Section cross-reference(s): 17, 45

IT 17773-41-0

RL: RCT (Reactant)

(hydrolysis of, process for)

IT 583-91-5P

RL: PREP (Preparation)

(manuf. of, hydrolysis and extn. process for)

L11 ANSWER 14 OF 15 HCAPLUS COPYRIGHT 2000 ACS

ACCESSION NUMBER: 1985:505316 HCAPLUS

DOCUMENT NUMBER: 103:105316

TITLE: Methionine hydroxy analog or its derivative and esters

and 1-acyloxy-3-hydrocarbylthiopropenes and products resulting from their synthesis

INVENTOR(S): Burrington, James David; Cesa, Mark Clark

PATENT ASSIGNEE(S): Standard Oil Co. (Ohio) , USA

SOURCE: Eur. Pat. Appl., 30 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 133796	A1	19850306	EP 1984-305228	19840801
EP 133796	B1	19870304		
R: BE, CH, DE, FR, GB, IT, LI, NL				
US 4782173	A	19881101	US 1983-520042	19830803
CA 1251463	A1	19890321	CA 1984-460202	19840802
JP 60100553	A2	19850604	JP 1984-163748	19840803
BR 8403914	A	19850709	BR 1984-3914	19840803
CA 1275111	A2	19901009	CA 1988-559288	19880218
PRIORITY APPLN. INFO.:			US 1983-520042	19830803
			CA 1984-460202	19840802
AB Methionine hydroxy analog or derivs. RSCH2CH2CH(OH)CO2H (I, R = C1-30 hydrocarbyl) were prepd. by treating RSCH2CH2CHO with R1COX (R1 = H, C1-30 hydrocarbyl; X = R1CO2, F, Cl, Br, etc.), treating the resulting RSCH2CH:CHO2CR1 with CO and R2YH (R2 = H, C1-30 hydrocarbyl, Y = O; R2 = C1-30 hydrocarbyl, Y = S), and hydrolyzing the resulting RSCH2CH2CH(O2CR1)COYR2. Thus, MeSCH2CH2CHO was treated with Ac2O in the presence of KOAc at 145.degree. for 3 h to give MeSCH2CH:CHOAc as a 43:57 Z/E mixt. The latter mixt. was treated with MeOH and CO in the presence of (Ph3P)2PdCl2 catalyst in a stainless steel bomb at 100.degree. for				

h to give 28.6% MeSCH<sub>2</sub>CH<sub>2</sub>CH(OAc)CO<sub>2</sub>Me (II) and 19.5% MeSCH<sub>2</sub>CH<sub>2</sub>CH(OAc)CSOMe. II was hydrolyzed by 2N HCl at 50.degree. for 4 h to give 92% I (R = Me).

IC ICM C07C149-20  
CC 34-2 (Amino Acids, Peptides, and Proteins)  
Section cross-reference(s): 23  
IT 97868-39-8P  
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation)  
(prepn. and **hydrolysis** of)

IT **583-91-5P** 869-29-4P 84292-11-5P 97868-35-4P 97868-36-5P  
97868-37-6P 97868-38-7P 97868-40-1P 97868-41-2P 97868-42-3P  
97868-43-4P  
RL: SPN (Synthetic preparation); PREP (Preparation)  
(prepn. of)

L11 ANSWER 15 OF 15 HCAPLUS COPYRIGHT 2000 ACS  
ACCESSION NUMBER: 1980:6896 HCAPLUS  
DOCUMENT NUMBER: 92:6896  
TITLE: Enantioselective synthesis of the hydroxy analogs of  
D- and L-methionine  
AUTHOR(S): Kleemann, Axel; Lehmann, Bernd; Martens, Juergen  
CORPORATE SOURCE: Fachber. Forsch. Chem., DEGUSSA, Hanau, D-6450, Fed.  
Rep. Ger.  
SOURCE: Angew. Chem. (1979), 91(10), 858-9  
CODEN: ANCEAD; ISSN: 0044-8249  
DOCUMENT TYPE: Journal  
LANGUAGE: German

AB D-Methionine underwent an enantioselective hydroxylation via a  
diazotization reaction to give 14.4% D-MeSCH<sub>2</sub>CH<sub>2</sub>CH(OH)CO<sub>2</sub>H (D-I), which  
was treated with aq. Ca(OH)<sub>2</sub> to give 88% D-I.1/2 Ca salt. L-Methionine  
also underwent this enantioselective conversion to L-I and its Ca salt.

CC 34-2 (Synthesis of Amino Acids, Peptides, and Proteins)  
Section cross-reference(s): 23  
IT 71597-89-2 71629-35-1  
RL: RCT (Reactant)  
(**hydrolysis** of)

IT **120-91-2P** 42588-21-6P 71597-88-1P  
RL: SPN (Synthetic preparation); PREP (Preparation)  
(prepn. of)

=> fil wpids

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FILE 'REGISTRY' ENTERED AT 13:45:20 ON 10 AUG 2000  
L1 1 S 583-91-5  
L2 1 S 7664-93-9

FILE 'WPIDS' ENTERED AT 13:45:43 ON 10 AUG 2000

FILE 'REGISTRY' ENTERED AT 13:45:52 ON 10 AUG 2000  
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L3 SEL L1 1- CHEM : 23 TERMS  
SET SMARTSELECT OFF

FILE 'WPIDS' ENTERED AT 13:45:55 ON 10 AUG 2000  
L4 29 S L3  
L5 35319 S SULFURIC OR SULPHURIC  
L6 4 S L4 AND L5  
L7 22 S HYDROXY (2W) METHYL THIO BUTYRIC OR HYDROXY (2W)  
METHYLTHIOB  
L8 7 S L7 AND L5  
L9 7 S L8 OR L6  
L10 45 S L4 OR L7  
L11 16 S L10 AND HYDROLYS?  
L12 9 S L11 NOT L9

FILE 'WPIDS' ENTERED AT 13:53:14 ON 10 AUG 2000

=> d .wp 19 1-7; d .wp 112 1-9

L9 ANSWER 1 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 2000-171109 [15] WPIDS  
 DNC C2000-053213  
 TI **Sulfuric** acid hydrolysis of 2-hydroxy 4-methylthiobutyronitrile to 2-**hydroxy-4-methylthiobutyric** acid, useful as an analog to methionine in animal feed, is carried out in two stages.  
 DC D13 E17  
 IN GARRAIT, M; GROS, G  
 PA (RHON) RHONE-POULENC NUTRITION ANIMALE; (RHON) RHONE-POULENC ANIMAL NUTRITION SA  
 CYC 78  
 PI WO 2000002852 A1 20000120 (200015)\* FR 23p  
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL  
 OA PT SD SE SL SZ UG ZW  
 W: AE AL AU BA BB BG BR CA CN CU CZ EE GD GE HR HU ID IL IN IS JP KP  
 KR LC LK LR LT LV MG MK MN MX NO NZ PL RO RU SG SI SK SL TR TT UA  
 US UZ VN YU ZA  
 FR 2780968 A1 20000114 (200015)  
 AU 9946245 A 20000201 (200028)  
 ADT WO 2000002852 A1 WO 1999-FR1637 19990707; FR 2780968 A1 FR 1998-8872 19980710; AU 9946245 A AU 1999-46245 19990707  
 FDT AU 9946245 A Based on WO 200002852  
 PRAI FR 1998-8872 19980710  
 AB WO 200002852 A UPAB: 20000419  
 NOVELTY - The hydrolysis of 2-hydroxy 4-methylthiobutyronitrile with **sulfuric** acid is carried out in two stages, first to form 2-hydroxy 4-methylthiobutyroamide and then, after addition of further water, to form 2-**hydroxy-4-methylthiobutyric** acid.  
 DETAILED DESCRIPTION - Process for the hydrolysis of 2-hydroxy 4-methylthiobutyronitrile (II) with **sulfuric** acid using 0.6 - 0.88 (0.7 - 0.85) mol H<sub>2</sub>SO<sub>4</sub> per mol (II), is carried out using a first stage in which the (II) is hydrolyzed to form 2-hydroxy 4-methylthiobutyroamide (III) using concentrated **sulfuric** acid in the presence of a mol. ratio of water to (II) of 1-3 (1-2.5) and at a temperature of less than or equal to 60 deg. C, then in a second stage (III) is hydrolyzed to 2-**hydroxy 4-methylthiobutyric** acid (I) in the presence of a supplementary amount of water.  
 USE - (I) is useful as an analog to methionine as a nutrient additive to animal feeds, particularly for poultry. (I) is marketed commercially as Rhodimet AT 88 (RTM) or **Alimet** (RTM).  
 ADVANTAGE - The process uses a smaller proportion of **sulfuric** acid overall in the hydrolysis of (II) to (I) than in previous processes so that the medium is less corrosive to processing equipment and less industrial waste products such as ammonium sulfate are produced.  
 Dwg.0/0

L9 ANSWER 2 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 2000-147594 [13] WPIDS  
 DNC C2000-046298  
 TI Separation of 2-**hydroxy-4-methylthiobutyric** acid, useful as an analog to methionine in animal feed, by neutralizing 2-hydroxy 4-methylthiobutyronitrile **sulfuric** hydrolyzate, decanting and extracting each phase with solvent.  
 DC D13 E17  
 IN CARENCOTTE, F; GARRAIT, M; GROS, G



PA (RHON) RHONE-POULENC NUTRITION ANIMALE; (RHON) RHONE-POULENC ANIMAL NUTRITION SA

CYC 78

PI WO 2000002853 A1 20000120 (200013)\* FR 22p  
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL  
 OA PT SD SE SL SZ UG ZW  
 W: AE AL AU BA BB BG BR CA CN CU CZ EE GD GE HR HU ID IL IN IS JP KP  
 KR LC LK LR LT LV MG MK MN MX NO NZ PL RO RU SG SI SK SL TR TT UA  
 US UZ VN YU ZA

FR 2780969 A1 20000114 (200017)

AU 9946244 A 20000201 (200028)

ADT WO 2000002853 A1 WO 1999-FR1636 19990707; FR 2780969 A1 FR 1998-8874  
 19980710; AU 9946244 A AU 1999-46244 19990707

FDT AU 9946244 A Based on WO 200002853

PRAI FR 1998-8874 19980710

AB WO 200002853 A UPAB: 20000313

NOVELTY - 2-hydroxy-4-methylthiobutyric acid is recovered from 2-hydroxy 4-methylthiobutyronitrile sufuric hydrolyzate by neutralizing, decanting and extracting each phase with solvent.

DETAILED DESCRIPTION - Process for purification of 2-hydroxy-4-methylthiobutyric acid (I) from an aqueous solution obtained by neutralization of a 2-hydroxy 4-methylthiobutyronitrile sufuric hydrolyzate with ammonia, comprises decanting the neutralized product and extracting each solution obtained with a sufficient amount of an organic solvent with low water miscibility to extract virtually all the (I) present.

USE - (I) is useful as an analog to methionine as a nutrient additive to animal feeds.

ADVANTAGE - The process gives high recovery yields of (I), gives products with low odor and good color, and consumes less energy than previous processes.  
 Dwg.1/1

L9 ANSWER 3 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD

AN 1999-329336 [28] WPIDS

DNN N1999-247189 DNC C1999-097594

TI Recovery of sulfuric acid used in hydrolysis of methylmercaptopropionaldehyde-cyanohydrin.

DC B05 C03 D13 E17 E36 P43

IN HAFNER, V; HASSEBERG, H A; HASSELBACH, H J; HEINZEL, H; HUTHMACHER, K; HAEFNER, V; HASSEBERG, H; HASSELBACH, H

PA (DEGS) DEGUSSA AG; (DEGS) DEGUSSA-HUELS AG

CYC 30

PI EP 922670 A1 19990616 (199928)\* DE 12p

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT  
 RO SE SI

DE 19754562 A1 19990610 (199929)

AU 9896987 A 19990701 (199937)

CN 1223230 A 19990721 (199947)

CA 2255483 A1 19990609 (199948) EN

JP 11246207 A 19990914 (199948) 8p

BR 9805253 A 20000201 (200023)

ADT EP 922670 A1 EP 1998-122921 19981202; DE 19754562 A1 DE 1997-19754562  
 19971209; AU 9896987 A AU 1998-96987 19981208; CN 1223230 A CN

1998-123185

19981209; CA 2255483 A1 CA 1998-2255483 19981208; JP 11246207 A JP

1998-347215 19981207; BR 9805253 A BR 1998-5253 19981209  
 PRAI DE 1997-19754562 19971209  
 AB EP 922670 A UPAB: 19991207

NOVELTY - Recovery of **sulfuric** acid used in hydrolysis of methylmercaptopropionaldehyde-cyanohydrin is carried out by combustion of sulfates produced during the reaction to give a sulfur dioxide-containing mixture, which is then reacted with hydrogen peroxide.

DETAILED DESCRIPTION - Recovery of **sulfuric** acid used in hydrolysis of methylmercaptopropionaldehyde-cyanohydrin (MMP-CH) comprises converting sulfate salt precipitates produced during the hydrolysis to SO2

in a furnace. The SO2-containing mixture is passed through an aqueous solution containing **sulfuric** acid and hydrogen peroxide, to convert the SO2 back to **sulfuric** acid.

An INDEPENDENT CLAIM is also included for preparation of 2-hydroxy-4-methylthiobutyric acid (MHA) by hydrolysis of MMP-CH in the presence of **sulfuric** acid to give MHA and ammonium hydrogen sulfate and/or ammonium sulfate. The MHA is isolated and the **sulfuric** acid is recovered and recycled using the above method.

USE - MHA is useful as an animal feed additive, especially for poultry.

ADVANTAGE - The method of the invention is carried out under relatively mild conditions and does not result in heavy metal or NOx impurities; the **sulfuric** acid produced can therefore be directly recycled. The technique is effective regardless of the SO2 concentration of the gas emerging from the furnace, and once the **sulfuric** acid has been separated the remaining waste gas can be released into the atmosphere without the need for further purification.  
 Dwg.0/3

L9 ANSWER 4 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 1997-342900 [32] WPIDS  
 DNC C1997-110397

TI Recovery of **hydroxy-methyl-thio-butyric** acid from reaction mixture - from hydrogen cyanide and methyl-mercapto-propanal, by adding salt and liquid extraction, useful as animal feed supplement.

DC D13 E16

IN HAFNER, V; HASSEBERG, H; HASSELBACH, H; HEINZEL, H; HUTHMACHER, K; JAGER, B; HAEFNER, V; JAEGER, B

PA (DEGS) DEGUSSA AG; (DEGS) DEGUSSA-HUELS AG  
 CYC 41

PI DE 19548538 A1 19970626 (199732)\* 29p  
 WO 9723452 A1 19970703 (199732) DE 74p  
 RW: AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE  
 W: AU BR BY CA CN CZ HU JP KP KR MX NO NZ PL RU SG SI SK TR UA US VN  
 AU 9711906 A 19970717 (199745)  
 DE 19548538 C2 19971218 (199803) 29p  
 EP 874811 A1 19981104 (199848) DE  
 R: AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE  
 CN 1205688 A 19990120 (199922)  
 BR 9612235 A 19990713 (199939)  
 MX 9804881 A1 19981001 (200019)  
 JP 2000502110 W 20000222 (200020) 58p  
 AU 717705 B 20000330 (200026)  
 TW 371655 A 19991011 (200036)

ADT DE 19548538 A1 DE 1995-19548538 19951223; WO 9723452 A1 WO 1996-EP5437 19961205; AU 9711906 A AU 1997-11906 19961205; DE 19548538 C2 DE 1995-19548538 19951223; EP 874811 A1 EP 1996-943038 19961205, WO 1996-EP5437 19961205; CN 1205688 A CN 1996-199293 19961205; BR 9612235 A BR 1996-12235 19961205, WO 1996-EP5437 19961205; MX 9804881 A1 MX 1998-4881 19980617; JP 2000502110 W WO 1996-EP5437 19961205, JP 1997-523255 19961205; AU 717705 B AU 1997-11906 19961205; TW 371655 A TW 1996-115766 19961220

FDT AU 9711906 A Based on WO 9723452; EP 874811 A1 Based on WO 9723452; BR 9612235 A Based on WO 9723452; JP 2000502110 W Based on WO 9723452; AU 717705 B Previous Publ. AU 9711906, Based on WO 9723452

PRAI DE 1995-19548538 19951223

AB DE 19548538 A UPAB: 19971030

A process is claimed for the recovery of 2-hydroxy-4-methyl thiobutyric acid (MHA) from a reaction mixture obtained by a condensation reaction of prussic acid (HCN) with methyl mercaptopropanal and hydrolysis of the resulting methyl mercaptopropanal cyanohydrin (MMP-CH) product with **sulphuric** acid. The salt content of the reaction mixture is brought to >50 wt.%, with respect to the sum of inorganic components in the reaction mixture; then the reaction mixture is brought into contact with an organic solvent immiscible in water, using a liquid/liquid extraction system to form an extraction solution containing the solvent and MHA, and the MHA is isolated by evaporating the solution.

USE - MHA is used as an animal feed supplement, especially for promoting growth in poultry.

ADVANTAGE - High purity MHA is obtained. The salt can be isolated and

added to a **sulphuric** acid recovery process. Less complicated equipment can be used to concentrate the reaction solution prior to extraction due to the lower corrosiveness of the solution, lower energy costs due to the use of hot hydrolysis product in the extraction step,

and better separation of high b.pt. fractions from the hydrolysis product. Hydrolysis of the MHA amide can be carried out in more dilute conditions for better hydrolysis.

Dwg.0/6

L9 ANSWER 5 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD

AN 1994-317376 [39] WPIDS

DNC C1994-144617

TI Sulphur tri oxide prepn. for **sulphuric** acid prodn. - from by-products of prepn. of 2-**hydroxy-4-methyl-thio butyric** acid, which contain sulphate, by combustion, sepn. of sulphate, oxidn. of sulphur di oxide etc..

DC D13 E17 E36

IN GREDEL, R W; KLOPFENSTEIN, J B; PROKOP, R K; REID, S L; WILLOCK, J M; WILLOCK, J M; WILLOCK, M

PA (MONS) MONSANTO CO; (NOVU-N) NOVUS INT INC; (NOVU-N) NOVUS INT; (GREN-I) GREDEL R W

CYC 48

PI ZA 9307163 A 19940831 (199439)\* 47p

TW 228504 A 19940821 (199439)

WO 9428717 A1 19941222 (199505) EN 47p

RW: AT BE CH DE DK ES FR GB GR IE IT LU MC NL OA PT SE

W: AT AU BB BG BR BY CA CH CZ DE DK ES FI GB HU JP KP KR KZ LK LU MG MN MW NL NO NZ PL PT RO RU SD SE SK UA VN

AU 9454085 A 19950103 (199522)

BR 9307863 A 19960206 (199612)  
 US 5498790 A 19960312 (199616) 15p  
 EP 705060 A1 19960410 (199619) EN  
 R: BE DE ES FR GB  
 CN 1096766 A 19941228 (199719)  
 EP 705060 A4 19970122 (199722)  
 JP 09504767 W 19970513 (199729) 36p  
 US 5670128 A 19970923 (199744) 15p  
 BR 1100778 A3 19980519 (199826)  
 SG 52611 A1 19980928 (199903)  
 ADT ZA 9307163 A ZA 1993-7163 19930927; TW 228504 A TW 1993-108920 19931027;  
 WO 9428717 A1 WO 1993-US10028 19931021; AU 9454085 A AU 1994-54085  
 19931021; BR 9307863 A BR 1993-7863 19931021, WO 1993-US10028 19931021;  
 US  
 5498790 A US 1993-73877 19930609; EP 705060 A1 EP 1993-924374 19931021,  
 WO  
 1993-US10028 19931021; CN 1096766 A CN 1993-119580 19931025; EP 705060 A4  
 EP 1993-924374 ; JP 09504767 W WO 1993-US10028 19931021, JP  
 1995-501713 19931021; US 5670128 A Cont of US 1993-73877 19930609, US  
 1996-604410 19960221; BR 1100778 A3 BR 1997-1100778 19970512; SG 52611 A1  
 SG 1996-6721 19931021  
 FDT AU 9454085 A Based on WO 9428717; BR 9307863 A Based on WO 9428717; EP  
 705060 A1 Based on WO 9428717; JP 09504767 W Based on WO 9428717; US  
 5670128 A Cont of US 5498790  
 PRAI US 1993-73877 19930609; US 1996-604410 19960221  
 AB ZA 9307163 A UPAB: 19941122  
 Prepn. of SO<sub>3</sub> comprises (a) introducing a feed mixt. comprising a  
 sulphate  
 feed soln. into a combustion zone in which fuel is burned with a gas  
 comprising O<sub>2</sub>, the feed soln. comprising a soln. obtd. as a by-prod. of  
 the prepn. of **2-hydroxy-4-(methylthio)-butyric acid** (I) by hydrolysis of  
 2-hydroxy-4-(methylthio)butyronitrile (II) with H<sub>2</sub>SO<sub>4</sub>, which comprises a  
 sulphate source selected from ammonium sulphate, ammonium bisulphate,  
 H<sub>2</sub>SO<sub>4</sub> and mixts. of these; (b) burning oxidisable components of the feed  
 soln. in the combustion zone to produce a combustion gas contg. SO<sub>2</sub>,  
 CO<sub>2</sub>, H<sub>2</sub>SO<sub>4</sub> vapour, N<sub>2</sub> and water vapour; (c) cooling the combustion gas to  
 condense water and H<sub>2</sub>SO<sub>4</sub> and produce a liq. phase comprising a weak  
 H<sub>2</sub>SO<sub>4</sub>;  
 (d) sepg. the weak H<sub>2</sub>SO<sub>4</sub> from the cooled combustion gas; (e) introducing  
 O<sub>2</sub> into the combustion gas to produce a feed gas contg. SO<sub>2</sub> and at least  
 ca. 0.9 moles O<sub>2</sub>/mole SO<sub>2</sub>; and (f) passing the feed gas over a catalyst  
 for the conversion of SO<sub>2</sub> to SO<sub>3</sub>.  
 The SO<sub>3</sub> formed may be absorbed into conc. H<sub>2</sub>SO<sub>4</sub> to form H<sub>2</sub>SO<sub>4</sub>.  
 USE/ADVANTAGE - The H<sub>2</sub>SO<sub>4</sub> produced is contacted with (II) for the  
 prepn. of (I) (claimed). Cpd. (I) is used as an essential aminoacid  
 source  
 in the prepn. of animal feeds. Sulphate by-prods. and purge stream from  
 the mfr. of (I) and other sulphate wastes and wastes having S value, fuel  
 value of both, are disposed of without waste by recycling in the process  
 for mfr. of (I). Net H<sub>2</sub>SO<sub>4</sub> requirements for the process and by-prod. vol.  
 are reduced. The process also provides an environmentally safe means for  
 disposing of waste (I) as a fuel and sulphur source.  
 Dwg.0/2

DNC C1989-111643  
 TI **2-Hydroxy 4-methylthio**  
**butyric acid** prepn. - by **sulphuric acid**  
 hydrolysis of the butyronitrile, neutralisation and sepn..  
 DC B05 C03 D13  
 IN HERNANDEZ, J A; MORENO, L R; AZAGRA, HERNANDEZ J; RUIZ, MORENO L;  
 AZAGRAHERN, J; RUIZMORENO, L  
 PA (DESA-N) SOC DESARROLLO TECNICO IND; (DESA-N) SOC DESARROLLO TECH IND;  
 (DESA-N) SOC DESARROLLO TECH; (RHON) RHONE POULENC NUTRITION ANIMALE  
 CYC 18  
 PI EP 330527 A 19890830 (198935)\* FR 9p  
 R: AT BE CH DE ES FR GB GR IT LI LU NL SE  
 ES 2005784 A 19890316 (198940)  
 PT 89776 A 19891004 (198945)  
 DK 8900788 A 19890822 (198948)  
 US 4912257 A 19900327 (199018)  
 EP 330527 B1 19920923 (199239) FR 10p  
 R: AT BE CH DE ES FR GB GR IT LI LU NL SE  
 DE 68902934 E 19921029 (199245)  
 CA 1308419 C 19921006 (199246) FR  
 ES 2045478 T3 19940116 (199407)  
 IE 63393 B 19950419 (199523)  
 ADT EP 330527 A EP 1989-400157 19890119; ES 2005784 A ES 1988-496 19880222;  
 US 4912257 A US 1989-309241 19890213; EP 330527 B1 EP 1989-400157 19890119;  
 DE 68902934 E DE 1989-602934 19890119, EP 1989-400157 19890119; CA  
 1308419  
 C CA 1989-590042 19890203; ES 2045478 T3 EP 1989-400157 19890119; IE  
 63393  
 B IE 1989-547 19890221  
 FDT DE 68902934 E Based on EP 330527; ES 2045478 T3 Based on EP 330527  
 PRAI ES 1988-496 19880222  
 AB EP 330527 A UPAB: 19930923  
 Aq. solns. of 2-hydroxy-4-methylthio butyric acid  $\text{CH}_3\text{S}-\text{CH}_2-\text{CH}_2-\text{CHOH}-\text{COOH}$   
 (I) are pred. by the hydrolysis, using **sulphuric acid**, of  
 2-hydroxy-4-methylthio butyronitrile (II), in which a) the acidic  
 hydrolysis mixt. and recycled material, is neutralised with  $\text{NH}_4\text{OH}$ , b) the  
 two phases from the neutralisation are sepd., c) the aq. phase from b)  
 is  
 concn. to ppt. ammonium sulphate, which is sepd. while the liq. contg.  
 traces of (I) is recycled, d) the organic phase from b) is concn. to form  
 a suspension, e) the suspension from d) is sepd. to eliminate residual  
 ammonium sulphate, f) ammonium sulphate from e) is dissolved in water and  
 recycled to a) to recover residual (I), and g) the liq. from e) is  
 diluted  
 with water and opt. stabilised with a small amt. of **sulphuric**  
 acid.  
 USE/ADVANTAGE - (I) is converted anabolically into DL-methionine,  
 and  
 so may be used as an animal feed supplement.  
 0/1  
 L9 ANSWER 7 OF 7 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 1985-124218 [21] WPIDS  
 DNC C1985-053887  
 TI **2-Hydroxy-4-methylthio-**  
**butyric acid** prodn. - from corresp. nitrile and

**sulphuric acid**, and animal feed supplements contg. it.

DC C03 D13 E17  
 IN RUEST, D A; TAKANO, M; WOLF, L R  
 PA (MONS) MONSANTO CO; (NUBS-N) NUBS INT INC US  
 CYC 19  
 PI EP 142488 A 19850522 (198521)\* EN 51p  
 R: AT BE CH DE FR IT LI LU NL SE  
 GB 2149791 A 19850619 (198525)  
 US 4524077 A 19850618 (198527)  
 AU 8435359 A 19850523 (198528)  
 JP 60156396 A 19850816 (198539)  
 ZA 8408847 A 19850814 (198543)  
 EP 142488 B 19870826 (198734) EN  
 R: AT BE CH DE FR IT LI LU NL SE  
 DE 3465592 G 19871001 (198740)  
 KR 8700657 B 19870404 (198745)  
 CN 85101575 A 19870110 (198806)  
 GB 2149791 B 19880420 (198816)  
 SU 1428193 A 19880930 (198915)  
 CA 1263668 A 19891205 (199002)  
 JP 05001787 B 19930111 (199305) 15p  
 JP 05211846 A 19930824 (199338) 25p  
 JP 07097970 B2 19951025 (199547) 15p  
 ADT EP 142488 A EP 1984-870150 19841113; GB 2149791 A GB 1984-28657 19841113;  
 US 4524077 A US 1983-550857 19831114; JP 60156396 A JP 1984-239325  
 19841113; ZA 8408847 A ZA 1984-8847 19841113; GB 2149791 B GB 1984-28362  
 19841109; SU 1428193 A SU 1984-3812267 19841113; JP 05001787 B JP  
 1984-239325 19841113; JP 05211846 A Div ex JP 1984-239325 19841113, JP  
 1992-199865 19841113; JP 07097970 B2 Div ex JP 1984-239325 19841113, JP  
 1992-199865 19841113  
 FDT JP 05001787 B Based on JP 60156396; JP 07097970 B2 Based on JP 05211846  
 PRAI US 1983-550857 19831114  
 AB EP 142488 A UPAB: 19930925  
 Prod. of **2-hydroxy-4-(methylthio)**  
**butyric acid** (I) is effected by (a) hydrolysing  
 2-hydroxy-4- (methylthio)butyronitrile (II) with 50-70% H2SO4 to obtain  
 an aq. soln. contg. 2-hydroxy-4---(methylthio)butyramide (III); (b)  
 hydrolysing (III) with 30-50% H2SO4; (c) extracting (I) from the  
 hydrolysate with a water-immiscible organic solvent; and (d) isolating  
 (I) from the extract.  
 New liq. animal feed supplements comprise 80-95 wt.% (I) and its  
 dimers and oligomers and 5-20 wt.% H2O, and have a Gardner colour of not  
 more than 10, a wt. ratio fo monomer to dimers+oligomers of at least  
 2.8:1 and a kinematic viscosity of not more than 90 cS at 25 deg.C, and  
 exhibit neither exotherms nor endotherms at temps. below 150 deg.C when  
 subjected to accelerating rate calorimetry.  
 USE/ADVANTAGE - (I) is useful as a methionine substitute in animal  
 (esp. poultry) feeds. The process gives (I) with good colour and odour  
 and a low viscosity.  
 0/4

AN 1998-363659 [32] WPIDS

DNC C1998-111935

TI Preparation of stable monomeric **2-hydroxy-4-methylthio-butyric acid** - comprises rapid low-pressure distillation of monomer-oligomer mixture useful as fodder additive or pharmaceutical.

DC B05 D13 E17

IN AXEL, R; HANS-ALBRECHT, H; HANS-JOACHIM, H; HARALD, H; KLAUS, H; VOLKER, H; HAEFNER, V; HASSEBERG, H; HASSELBACH, H; HEINZEL, H; HUTHMACHER, K; RONNEBURG, A; HASSELBACH, H J; HAFNER, V; HASSEBERG, H A

PA (DEGS) DEGUSSA-HUELS AG; (DEGS) DEGUSSA AG

CYC 7

PI DE 19654485 A1 19980702 (199832)\* 29p

FR 2757854 A1 19980703 (199833)

JP 10195045 A 19980728 (199840) 17p

BR 9706466 A 19990601 (199927)

US 6008409 A 19991228 (200007)

MX 9710231 A1 19980601 (200009)

BE 1011834 A3 20000201 (200013)

ADT DE 19654485 A1 DE 1996-19654485 19961227; FR 2757854 A1 FR 1997-16314 19971223; JP 10195045 A JP 1997-355081 19971224; BR 9706466 A BR 1997-6466

19971226; US 6008409 A US 1997-999000 19971229; MX 9710231 A1 MX

1997-10231 19971216; BE 1011834 A3 BE 1997-1026 19971216

PRAI DE 1996-19654485 19961227

AB DE 19654485 A UPAB: 19980812

Preparation of storage stable **2-hydroxy-4-**

**methylthio-butyric acid** (MHA) comprises distillation of a product containing >95 wt.% of a mixture of monomeric and oligomeric components of MHA. Distillation is under reduced pressure and over a time span short enough to avoid formation of by-products.

Also claimed is a process for preparing MHA by isolation from a reaction mixture produced as follows; reaction of HCN and methylmercaptopropionaldehyde (MMP); **hydrolysis** of the obtained cyanohydrin (MMP-CH) with mineral acid; extraction with organic solvent

in

a liquid-liquid extraction system; evaporation of solvent from the extract; distillation to give a distillate which is chiefly MHA monomers and a bottom product of MHA dimers and oligomers; and regenerating MHA monomers by adding the bottom product to the **hydrolysis** of MMP-CH and/or MHA amide.

Also claimed is the MHA obtained by these processes, containing >95% MHA (calculated as the sum of the monomer, dimer and oligomers), a kinematic viscosity of > 100 mm<sup>2</sup>/s at 25 deg. C and a content of <10 mole % monomeric MHA (sic).

USE - (I) is mixed with water (and optionally methionine or ammonia) to produce animal feed additives which have iodine colour number below 20 and contain less than 25 mol % oligomers after storage for 200 days at 25 deg. C. (I) is also useful as a pharmaceutical (claimed) as a substitute for dialysis in renal insufficiency.

ADVANTAGE - The product with a lower oligomer content has a lower viscosity and so is easier to handle (e.g. by pump). The mixture with a higher monomer content has a higher biological value.

Dwg.0/0

L12 ANSWER 2 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD

AN 1998-272231 [24] WPIDS

DNC C1998-085072  
 TI Production of 2-hydroxy-4-methyl thio  
 butyric acid from corresponding nitrile - by hydrolysis  
 with immobilised nitrilase or nitrilase-containing cells, useful as  
 substitute for methionine in animal nutrition.  
 DC B05 C03 D13 D16  
 IN DAVID, C; FAVRE, B O; HORBEZ, D; MOREL, P; PIERRARD, J; FAVRE-BULLE, O  
 PA (RHON) RHONE-POULENC NUTRITION ANIMALE  
 CYC 71  
 PI WO 9818941 A1 19980507 (199824)\* FR 60p  
 RW: AT BE CH DE DK EA ES FI FR GB GH GR IE IT KE LS LU MC MW NL OA PT  
 SD SE SZ UG ZW  
 W: AL AU BA BB BG BR CA CN CU CZ EE GE GH HU ID IL IS JP KP KR LC LK  
 LR LT LV MG MK MN MX NO NZ PL RO RU SG SI SK SL TR TT UA UZ VN YU  
 FR 2755143 A1 19980430 (199824)  
 AU 9749513 A 19980522 (199840)  
 EP 934419 A1 19990811 (199936) FR  
 R: AT BE CH DE DK ES FI FR GB GR IE IT LI LU NL PT SE  
 CZ 9901454 A3 19990811 (199937)  
 BR 9712558 A 19991019 (200008)  
 CN 1234074 A 19991103 (200011)  
 HU 9904513 A2 20000528 (200035)  
 ADT WO 9818941 A1 WO 1997-FR1913 19971024; FR 2755143 A1 FR 1996-13077  
 19961025; AU 9749513 A AU 1997-49513 19971024; EP 934419 A1 EP  
 1997-912254  
 19971024, WO 1997-FR1913 19971024; CZ 9901454 A3 WO 1997-FR1913 19971024,  
 CZ 1999-1454 19971024; BR 9712558 A BR 1997-12558 19971024, WO  
 1997-FR1913  
 19971024; CN 1234074 A CN 1997-199025 19971024; HU 9904513 A2 WO  
 1997-FR1913 19971024, HU 1999-4513 19971024  
 FDT AU 9749513 A Based on WO 9818941; EP 934419 A1 Based on WO 9818941; CZ  
 9901454 A3 Based on WO 9818941; BR 9712558 A Based on WO 9818941; HU  
 9904513 A2 Based on WO 9818941  
 PRAI FR 1996-13077 19961025  
 AB WO 9818941 A UPAB: 19980617  
 Production of 2-hydroxy-4-methylthiobutyric acid (I)  
 and/or its ammonium salt (Ia) from 2-hydroxy-4-methylthiobutyronitrile  
 (II) comprises contacting (II) with an immobilised material having  
 nitrilase (III) activity to generate (Ia), optionally converting this to  
 free acid, and concentrating the product.  
 Also new are: (1) an aqueous solution containing (I) and (Ia) at  
 weight ratio (I)/[(I)+(Ia)] of 5-99.9, preferably 10-50,%; (2) a device  
 for the process, as above, comprising reaction chambers containing  
 immobilised (III) or host cells expressing (III), optionally an  
 electrodialysis unit and a means of concentrating the final product; and  
 (3) the plasmid pRPA-BCAT3 (CBS 998-96).  
 USE - (I) and its salts are useful as animal feed additives as  
 replacement for methionine.  
 ADVANTAGE - Unlike methionine, (I) and (Ia) can be formulated as  
 liquids for easier application. This method produces (I) on an industrial  
 scale with high yield and without use of solvents or simultaneous  
 production of inorganic salts.  
 Dwg.5/11



TI Preparation of alpha hydroxy acids from nitrile compounds - using a microorganism concn. resistant and durable to these compounds.

DC D13 D16 E19

IN HAYAKAWA, K; KOBAYASHI, Y; OHIRA, M; WATABE, K

PA (NIPS) NIPPON SODA CO

CYC 74

PI WO 9732030 A1 19970904 (199742)\* JA 22p

RW: AT BE CH DE DK EA ES FI FR GB GH GR IE IT KE LS LU MC MW NL OA PT SD SE SZ UG

W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE HU IL IS JP KE KG KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK TJ TM TR TT UA UG US UZ VN

AU 9718119 A 19970916 (199803)

JP 09530795 X 19990427 (199927)

CN 1212018 A 19990324 (199931)

EP 974669 A1 20000126 (200010) EN

R: BE DE ES FR

US 6037155 A 20000314 (200020)

ADT WO 9732030 A1 WO 1997-JP578 19970227; AU 9718119 A AU 1997-18119 19970227;

JP 09530795 X JP 1997-530795 19970227, WO 1997-JP578 19970227; CN 1212018 A CN 1997-192578 19970227; EP 974669 A1 EP 1997-903619 19970227, WO 1997-JP578 19970227; US 6037155 A WO 1997-JP578 19970227, US 1998-125150 19980811

FDT AU 9718119 A Based on WO 9732030; JP 09530795 X Based on WO 9732030; EP 974669 A1 Based on WO 9732030; US 6037155 A Based on WO 9732030

PRAI JP 1996-346655 19961210; JP 1996-69288 19960229

AB WO 9732030 A UPAB: 19971021

(A) Preparation of an alpha -hydroxycarboxylic acid of formula  $RCH(OH)COOH$

(II) comprises **hydrolysis** of the corresponding alpha -hydroxynitrile of formula  $RCH(OH)CN$  (I) by the action of a microorganism which is resistant to the concentration of (I) and/or (II). (II) accumulates in, and is extracted from, an aqueous solvent. R = H, or (all optionally substituted) 1-6C alkyl, 2-6C alkenyl, 1-6C alkoxy, aryl, aryloxy or heterocycle. (B) Also claimed is the preparation of (II) from (I) by **hydrolysis** with a microorganism in the presence of a cyanide of formula  $Mm(CN)_n$  (III).

M = H,  $NH_4^+$  or a metal ion; m, n = 1-3.

Also claimed is *Arthrobacter* NSCC104, which can be used in the preparation.

USE - The process is used to prepared lactic acid (useful in food, brewing and production processes) and 2-**hydroxy-4-methylthiobutyric** acid, useful in feed.

Dwg.0/0

L12 ANSWER 4 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD

AN 1997-021681 [02] WPIDS

CR 1997-108632 [10]

DNC C1997-007032

TI Catalysts for prepn. of methyl thiopropanal and its cyanohydrin - are amine(s), pyridine(s), imidazole(s), can be combined without purificn. step, prods. are intermediates for methionine prodn..

DC B05 D13 E19 J04

IN BLACKBURN, T F; KRANZ, A H; PELLEGRIN, P F

PA (NOVU-N) NOVUS INT INC

CYC 7

PI ZA 9604335 A 19961030 (199702)\* 35p  
 AU 9659873 A 19961230 (199716)  
 US 5663409 A 19970902 (199741) 7p  
 TW 331557 A 19980511 (199841)  
 JP 11511119 W 19990928 (199952) 34p  
 AU 714151 B 19991223 (200011)  
 BR 1100760 A3 19991019 (200013)  
 KR 99022564 A 19990325 (200023)

ADT ZA 9604335 A ZA 1996-4335 19960528; AU 9659873 A AU 1996-59873 19960604;  
 US 5663409 A US 1995-476356 19950607; TW 331557 A TW 1996-106136  
 19960523;  
 JP 11511119 W WO 1996-US9060 19960604, JP 1997-501471 19960604; AU 714151  
 B AU 1996-59873 19960604; BR 1100760 A3 BR 1997-1100760 19970512; KR  
 99022564 A WO 1996-US9060 19960604, KR 1997-709045 19971206

FDT AU 9659873 A Based on WO 9640631; JP 11511119 W Based on WO 9640631; AU  
 714151 B Previous Publ. AU 9659873, Based on WO 9640631; KR 99022564 A  
 Based on WO 9640631

PRAI US 1995-476356 19950607; US 1995-581249 19951229

AB ZA 9604335 A UPAB: 20000516  
 (A) Prepn. of 3-methyl thiopropanal (MMP), by reacting methanethiol with  
 acrolein in a reaction zone in presence of an organic base (OB), which is  
 triisopropanolamine, tripropylamine, nicotinamide, imidazole,  
 benzimidazole, 2-fluoropyridine, picoline, 4-dimethylaminopyridine,  
 pyrazine, tri(5-18C alkyl)amines, arylalkyl-dialkylamines of formula (I)  
 or their mixts., is new:  

$$[A-(CH_2)_x]a-N(R_1)b(R_2)c \quad (I)$$
  
 in which A = aryl; R<sub>1</sub>, R<sub>2</sub> = alkyl; x = 0-3; a = 1-3; b, c = 0-2;  
 provided that a+b+c = 3.  
 (B) Prepn. of 2-hydroxy-4-methylthio-butanonitrile (HMBN, MMP  
 cyanohydrin), by reacting MMP with HCN in the presence of an OB which is  
 as in the list above, is also new.  
 (C) Thirdly, prepn. of HMBN, by reacting methanethiol with acrolein  
 as in (A), and without sepn. of the catalyst, and opt. with addn. of more  
 OB, reacting the MMP with HCN to produce HMBA, is new.  
 USE - MMP and HMBA are successive intermediates in the manufacture  
 of both DL-methionine and **2-hydroxy-4-methylthio-butanoic acid** (HMBA), which can be  
 converted to methionine. Both are used as such in animal feed  
 formulations. Although certain basic catalysts, e.g. pyridine,  
 triethylamine, and hexamethylene tetramine, for the reactions are known,  
 the invention identifies additional catalysts; and for the combined  
 process as in (C), the opt. base added for the HMBN stage can be either  
 one of the new OB, possibly the same as for the MMP prodn. stage or one  
 from prior art.  
 The processes can be carried out batchwise or continuously; mfg.  
 details are well known from process operation with prior art catalysts.  
 The MMP is sufficiently pure, without distn. for use in mfr. of HMBN; and  
 the HMBN prod. can be used as such, without purificn., for  
**hydrolysis** to HMBA. (Reissue of the entry advised in week 9649  
 based on complete specification).  
 Dwg.0/0

L12 ANSWER 5 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 1996-117520 [13] WPIDS  
 DNC C1996-037295  
 TI Recovery of **2-hydroxy-4-methylthio**

**-butyric acid - from cyanohydrin hydrolysis**  
 mixt., by evaporating mixt., suspending salt residue in organic solvent, removing solids etc..

DC B05 C03 D13 E17  
 IN HAFNER, V; SUCHSLAND, H; HAEFNER, V  
 PA (DEGS) DEGUSSA AG; (DEGS) DEGUSSA-HUELS AG  
 CYC 65  
 PI DE 4428608 C1 19960229 (199613)\* 15p  
 WO 9605173 A1 19960222 (199614) DE 45p  
 RW: AT BE CH DE DK ES FR GB GR IE IT KE LU MC MW NL OA PT SD SE SZ UG  
 W: AM AU BB BG BR BY CA CN CZ EE FI GE HU IS JP KG KP KR KZ LK LR LT  
 LV MD MG MN MX NO NZ PL RO RU SG SI SK TJ TM TT UA US UZ VN  
 AU 9532557 A 19960307 (199624)  
 TW 280811 A 19960711 (199647)  
 EP 775109 A1 19970528 (199726) DE  
 R: BE DE DK ES FR GB GR IT NL PT  
 JP 10504294 W 19980428 (199827) 33p  
 US 5847207 A 19981208 (199905)  
 EP 775109 B1 19990120 (199908) DE  
 R: BE DE DK ES FR GB GR IT NL PT  
 DE 59504922 G 19990304 (199915)  
 ES 2132700 T3 19990816 (199939)  
 ADT DE 4428608 C1 DE 1994-4428608 19940812; WO 9605173 A1 WO 1995-EP3068  
 19950802; AU 9532557 A AU 1995-32557 19950802; TW 280811 A TW 1995-106640  
 19950628; EP 775109 A1 EP 1995-929050 19950802, WO 1995-EP3068 19950802;  
 JP 10504294 W WO 1995-EP3068 19950802, JP 1996-506978 19950802; US  
 5847207  
 A WO 1995-EP3068 19950802, US 1997-793113 19970513; EP 775109 B1 EP  
 1995-929050 19950802, WO 1995-EP3068 19950802; DE 59504922 G DE  
 1995-504922 19950802, EP 1995-929050 19950802, WO 1995-EP3068 19950802;  
 ES 2132700 T3 EP 1995-929050 19950802  
 FDT AU 9532557 A Based on WO 9605173; EP 775109 A1 Based on WO 9605173; JP  
 10504294 W Based on WO 9605173; US 5847207 A Based on WO 9605173; EP  
 775109 B1 Based on WO 9605173; DE 59504922 G Based on EP 775109, Based on  
 WO 9605173; ES 2132700 T3 Based on EP 775109  
 PRAI DE 1994-4428608 19940812  
 AB DE 4428608 C UPAB: 19960329  
 A process for recovering **2-hydroxy-4-methylthio-butyrac acid** (I) from a reaction  
 mixt. obtd. by reacting 3-methylthio-propionaldehyde (II) with HCN and  
**hydrolysing** the resulting cyanohydrin (III) with H2SO4, comprises  
 evaporating the reaction mixt. down to a residual water content of 5% or  
 less based on (I) + oligomers; suspending the resulting (I)-contg. salt  
 residue in an organic solvent removing solids from the suspension to  
 obtain a (I)-contg. soln.; and removing the solvent from the soln.  
 (III) is **hydrolysed** by reaction with 60-85% H2SO4 in a  
 molar ratio of 1:0.5-1 and 20-60deg. C to form the amide, which is  
**hydrolysed** to (I) by adding water and opt. H2SO4 and heating at  
 90-110deg. C or reflux temp. The reaction mixt. is evaporated under  
 vacuum  
 at 60deg. C or less, opt. after neutralising it with ammonia. The residue  
 is suspended in acetone, methylisopropylketone, methylisobutylketone,  
 isopropanol, toluene or THF. The suspension is filtered and the solvent  
 is removed from the filtrate by rectification and/or azeotropic distn.  
 The NH4 salt (sulphate or bisulphate) recovered by filtration can be

sent to a contact process unit to regenerate H<sub>2</sub>SO<sub>4</sub>.

USE - (I) is useful as an animal feed additive, e.g. a poultry growth promoter.

ADVANTAGE - High purity liq. (I) with a low oligomer content is obtd. without producing salt laden waste water.  
Dwg.0/4

L12 ANSWER 6 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD

AN 1996-069811 [08] WPIDS

DNC C1996-022786

TI 2-**Hydroxy-4-methyl-thio-butyric**

acid recovery in high concn. and purity - comprises liq.-liq. extn. of acid-**hydrolysed** methyl-mercapto-propionaldehyde cyanohydrin and evapn. to dryness, useful in animal feed supplement.

DC D13 E17

IN HAFNER, V; HASSEBERG, H; HEINZEL, H; HUTHMACHER, K; TANNER, H; KOHL, H; SUCHSLAND, H; HAEFNER, V; HASSEDRG, H

PA (DEGS) DEGUSSA AG

CYC 65

PI DE 19524054 A1 19960118 (199608)\* 28p

WO 9601808 A1 19960125 (199610) DE 61p

RW: AT BE CH DE DK ES FR GB GR IE IT KE LU MC MW NL OA PT SD SE SZ UG

W: AM AU BB BG BR BY CA CN CZ EE FI GE HU IS JP KG KP KR KZ LK LR LT

LV MD MG MN MX NO NZ PL RO RU SG SI SK TJ TM TT UA US UZ VN

WO 9601809 A1 19960125 (199610) DE 58p

RW: AT BE CH DE DK ES FR GB GR IE IT KE LU MC MW NL OA PT SD SE SZ UG

W: AM AU BB BG BR BY CA CN CZ EE FI GE HU IS JP KG KP KR KZ LK LR LT

LV MD MG MN MX NO NZ PL RO RU SG SI SK TJ TM TT UA US UZ VN

AU 9528883 A 19960209 (199619)

AU 9529815 A 19960209 (199619)

EP 770060 A1 19970502 (199722) DE

R: BE DE ES FR GB GR IT NL PT

EP 770061 A1 19970502 (199722) DE

R: BE DE ES FR GB GR IT NL PT

BR 9508383 A 19971223 (199806)

TW 321606 A 19971201 (199814)

JP 10502378 W 19980303 (199819) 47p

JP 10502382 W 19980303 (199819) 47p

MX 9700300 A1 19970501 (199823)

AU 690714 B 19980430 (199829)

KR 97704679 A 19970906 (199839)

TW 332197 A 19980521 (199842)

EP 770060 B1 19990120 (199908) DE

R: BE DE ES FR GB GR IT NL PT

DE 59504919 G 19990304 (199915)

EP 770061 B1 19990407 (199918) DE

R: BE DE ES FR GB GR IT NL PT

DE 59505601 G 19990512 (199925)

ES 2132685 T3 19990816 (199939)

ES 2132691 T3 19990816 (199939)

US 5976609 A 19991102 (199953)

RU 2130925 C1 19990527 (200027)

ADT DE 19524054 A1 DE 1995-19524054 19950701; WO 9601808 A1 WO 1995-EP2600

19950705; WO 9601809 A1 WO 1995-EP2515 19950628; AU 9528883 A AU

1995-28883 19950628; AU 9529815 A AU 1995-29815 19950705; EP 770060 A1 EP

1995-925831 19950705, WO 1995-EP2600 19950705; EP 770061 A1 EP  
1995-924331  
19950628, WO 1995-EP2515 19950628; BR 9508383 A BR 1995-8383 19950628, WO  
1995-EP2515 19950628; TW 321606 A TW 1995-107055 19950707; JP 10502378 W  
WO 1995-EP2515 19950628, JP 1996-504084 19950628; JP 10502382 W WO  
1995-EP2600 19950705, JP 1996-504105 19950705; MX 9700300 A1 MX 1997-300  
19970110; AU 690714 B AU 1995-28883 19950628; KR 97704679 A WO  
1995-EP2515  
19950628, KR 1997-700125 19970110; TW 332197 A TW 1995-107053 19950707;  
EP  
770060 B1 EP 1995-925831 19950705, WO 1995-EP2600 19950705; DE 59504919 G  
DE 1995-504919 19950705, EP 1995-925831 19950705, WO 1995-EP2600  
19950705;  
EP 770061 B1 EP 1995-924331 19950628, WO 1995-EP2515 19950628; DE  
59505601  
G DE 1995-505601 19950628, EP 1995-924331 19950628, WO 1995-EP2515  
19950628; ES 2132685 T3 EP 1995-924331 19950628; ES 2132691 T3 EP  
1995-925831 19950705; US 5976609 A WO 1995-EP2515 19950628, US  
1997-776217  
19970113; RU 2130925 C1 WO 1995-EP2515 19950628, RU 1997-102150 19950628  
FDT AU 9528883 A Based on WO 9601809; AU 9529815 A Based on WO 9601808; EP  
770060 A1 Based on WO 9601808; EP 770061 A1 Based on WO 9601809; BR  
9508383 A Based on WO 9601809; JP 10502378 W Based on WO 9601809; JP  
10502382 W Based on WO 9601808; AU 690714 B Previous Publ. AU 9528883,  
Based on WO 9601809; KR 97704679 A Based on WO 9601809; EP 770060 B1  
Based  
on WO 9601808; DE 59504919 G Based on EP 770060, Based on WO 9601808; EP  
770061 B1 Based on WO 9601809; DE 59505601 G Based on EP 770061, Based on  
WO 9601809; ES 2132685 T3 Based on EP 770061; ES 2132691 T3 Based on EP  
770060; US 5976609 A Based on WO 9601809; RU 2130925 C1 Based on WO  
9601809  
PRAI DE 1994-4424043 19940711  
AB DE 19524054 A UPAB: 19981028  
Recovery of 2-hydroxy-4-methylthiobutyric acid (MHA)  
from a reaction mixt. obtd. by addn. of HCN to  
methylmercaptopropionaldehyde (MMP) and hydrolysis of the  
resultant methylmercaptopropionaldehyde cyanohydrin (MMP-CH) with H2SO4  
is  
new. This involves liq./liq. extn. with a water-immiscible solvent and  
recovery of MHA by evaporating the extn. soln. to dryness. The novelty is  
that evapn. to dryness is carried out in such a way that the remaining  
extract contains < 4 wt.% water. Also claimed is MHA prepd. as above.  
USE - (I) is useful for producing mixts. for animal feed supplements  
(claimed).  
ADVANTAGE - MHA is obtd. in a very high concn. and purity by a  
simple  
and economical method. The prod. has a low content of dimer, oligomers  
and  
impurities.  
Dwg.0/6  
L12 ANSWER 7 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
AN 1985-129815 [22] WPIDS  
DNC C1985-056410  
TI 2-hydroxy-4-methylthio-  
butyric acid prepn. - by complete hydrolysis  
of nitrile with mineral acid and solvent extn..

DC B05 C03 D13  
 IN RUEST, D A; TAKANO, M; WOLF, L R  
 PA (MONS) MONSANTO CO  
 CYC 14  
 PI EP 143100 A 19850529 (198522)\* EN 53p  
     R: AT BE CH DE FR GB IT LI LU NL SE  
     JP 60166661 A 19850829 (198541)  
     EP 143100 B 19870805 (198731) EN  
     R: AT BE CH DE FR GB IT LI LU NL SE  
     DE 3465194 G 19870910 (198737)  
     CN 85101573 A 19870110 (198806)  
     CA 1269995 A 19900605 (199030)  
     JP 04030948 B 19920525 (199225) 16p  
 ADT EP 143100 A EP 1984-870151 19841113; JP 60166661 A JP 1984-239324  
     19841113; JP 04030948 B JP 1984-239324 19841113  
 FDT JP 04030948 B Based on JP 60166661  
 PRAI US 1983-551231 19831114  
 AB EP 143100 A UPAB: 19930925  
     Prepn. of **2-hydroxy -4-methylthiobutyric acid (I)**  
     comprises (1) **hydrolysis** of 2-hydroxy -4-methylthio  
     b-tyronitrile (II) with mineral acid to give an aq. **hydrolysate**  
     contg. (I) and free from unreacted (II) and from 2-hydroxy -4-methylthio  
     butyramide; (2) without sepn. of solids present, contact of the  
     **hydrolysate** with a water-immiscible organic solvent in a  
     liquid/liquid extrn. system to give an extract contg. (I). The extrn.  
     conditions are controlled so that the extract and an aq. raffinate are  
 the only liq. phases formed on phase sepn. after the extrn.; and (c) recovery  
     of (I) from the extract.  
     USE/ADVANTAGE - A conc. soln. of (I) having a lighter colour,  
 reduced odour, lower viscosity and better thermal stability than with (I) obtd.  
 by the usual processes is obtd. (I) in soln. can be produced with reduced  
     energy costs and overall conversion costs. During recovery of the (I)  
 from the soln. discolouration and oligomerisation are minimised. (I) is a  
     l-methione analogue and is effective for replacing methionine as a  
     nutritional additive, esp. in poultry feeds.  
 0/4

L12 ANSWER 8 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
 AN 1983-850377 [51] WPIDS  
 DNC C1983-125442  
 TI Removing ions from **2-hydroxy-4-**  
     **methylthio-butyric acid** reaction mixt. - using  
     electrodialysis cell.  
 DC B05 C03 E16 J03  
 IN BREDA, E J; KEATING, K B  
 PA (MONS) MONSANTO CO  
 CYC 1  
 PI US 4419198 A 19831206 (198351)\* 5p  
 PRAI US 1981-275670 19810622  
 AB US 4419198 A UPAB: 19930925  
     Sepn. of anions and cations from a reaction mixt. obtd. by acid  
     **hydrolysis** of 2-hydroxy-4 (methylthio)butyronitrile (MHBN) to  
     **2-hydroxy-4 (methylthio)**

**butyric acid** (MHBA), comprises introducing the mixt. into an electrolytic cell having 3 or more compartments. The mixt. is fed into a process compartment (PC) sepg. the anode (AC) and cathode (CC) compartments, which are separated from the PC by an anion-exchange and a cation exchange membrane resp. The anolyte and catholyte are water or aq. H<sub>2</sub>SO<sub>4</sub> of up to 10% concn.

2-20V d.c./cell is applied, passing up to ca. 450 A-hr. per l of reaction mixt., and the purified MHBA reaction mixt. is recovered. Pref. SO<sub>4</sub>(2-) and NH<sub>4</sub>(+) ions are removed, resulting from H<sub>2</sub>SO<sub>4</sub>

**hydrolysis** of MHBN.

MHBN is the hydroxy analogue of methionine and has equivalent nutrient value. The Ca salt of MHBA is used to fortify animal feeds. This salt may be obtd. by treating the ion-free MHBA soln. with Ca(OH)<sub>2</sub> with little or no by-prod., gypsum formation, thus reducing handling problems, waste disposal, avoiding use of large excesses of Ca(OH)<sub>2</sub> and extra

water,  
and reducing reactor fouling.  
0/2

L12 ANSWER 9 OF 9 WPIDS COPYRIGHT 2000 DERWENT INFORMATION LTD  
AN 1982-92641E [43] WPIDS  
TI aq. 2-hydroxy-4-methyl thio-butanoic acid animal feed supplement -  
neutralised to pH 0.9-1.2 to reduce corrosion characteristics.  
DC C03 D13  
IN BAKER, J W; MANSFIELD, D L; WEINKAUFF, D J  
PA (MONS) MONSANTO CO  
CYC 1  
PI US 4353924 A 19821012 (198243)\* 3p  
PRAI US 1979-72541 19790904; US 1982-466750 19820927  
AB US 4353924 A UPAB: 19930915  
Animal feed supplement with reduced metal corrosion comprises an aq.  
soln.

of 87-90 (88) wt.% **2-hydroxy-4-methylthio -butanoic acid** (I) of pH 0.8-1.2 (0.9). The soln. is pref. prepd. by **hydrolysing** (I)-nitrile in excess mineral acid to give a dil. aq. slurry of mineral acid, (I) and the salt of the mineral acid.

The slurry is dehydrated to remove water and mineral acid and ppte. the salt of the mineral acid. The remaining slurry is filtered and centrifuged to separate the salt, then water is added to give a soln. of 87-90 wt.% (I) and 0.3-0.5% residual mineral acid. The pH of this soln.

is then adjusted to 0.9-1.2 so that residual mineral acid is neutralised without neutralising (I).

Corrosion of e.g. carbon steel, stainless steel, Al, etc. is reduced so that metal materials unusable with the non-neutralised soln. may be employed. The soln. has physical characteristics comparable to those of the non-neutralised material.

Calve 09/350152

=> @ his.

(FILE 'HCAPLUS' ENTERED AT 13:42:56 ON 10 AUG 2000)  
DEL HIS Y

FILE 'REGISTRY' ENTERED AT 13:43:07 ON 10 AUG 2000  
ACT CALVE/A

L1 STR  
L2 ~~24 SEA FILE=REGISTRY FAM FUL L1~~  
L3 ~~1 S 7664-93-9~~

FILE 'HCAPLUS' ENTERED AT 13:43:27 ON 10 AUG 2000  
L4 398 S L2  
L5 61905 S L3  
L6 13 S L4 AND L5

=> fil reg

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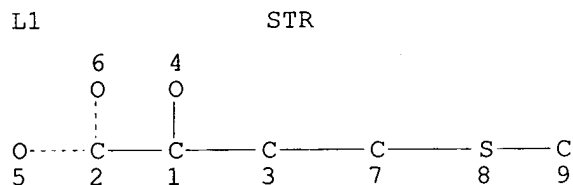
STRUCTURE FILE UPDATES: 9 AUG 2000 HIGHEST RN 284660-39-5  
DICTIONARY FILE UPDATES: 9 AUG 2000 HIGHEST RN 284660-39-5

TSCA INFORMATION NOW CURRENT THROUGH JANUARY 11, 2000

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for details.

=> d que stat 12



NODE ATTRIBUTES:  
DEFAULT MLEVEL IS ATOM  
DEFAULT ECLEVEL IS LIMITED

GRAPH ATTRIBUTES:  
RING(S) ARE ISOLATED OR EMBEDDED  
NUMBER OF NODES IS 9

STEREO ATTRIBUTES: NONE

L2 ~~24 SEA FILE=REGISTRY FAM FUL L1~~

Page 1

*family search for 2-Hydroxy-4-methylthio  
butyric acid.*



Calve 09/350152

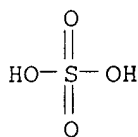
100.0% PROCESSED 793 ITERATIONS  
SEARCH TIME: 00.00.01

24 ANSWERS

=> d que 13 ;d 13

L3 1 SEA FILE=REGISTRY ABB=ON 7664-93-9

L3 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2000 ACS  
RN 7664-93-9 REGISTRY  
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)  
OTHER NAMES:  
CN BOV  
CN Contact acid  
CN Dihydrogen sulfate  
CN Dipping acid  
CN Oil of vitriol  
CN Sulphuric acid  
CN Vitriol brown oil  
FS 3D CONCORD  
DR 127529-01-5, 119540-51-1, 140623-70-7  
MF H2 O4 S  
CI COM  
LC STN Files: AGRICOLA, ANABSTR, APILIT, APILIT2, APIPAT, APIPAT2,  
BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CABA, CANCERLIT, CAOLD, CAPLUS,  
CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN,  
CSCHEM, CSNB, DDFU, DETHERM\*, DIPPR\*, DRUGU, EMBASE, GMELIN\*, HSDB\*,  
IFICDB, IFIPAT, IFIUDB, IPA, MEDLINE, MRCK\*, MSDS-OHS, NIOSHTIC,  
PDLCOM\*, PIRA, PROMT, RTECS\*, SPECINFO, TOXLINE, TOXLIT, TRCTHERMO\*,  
TULSA, ULIDAT, USAN, USPATFULL, VTB  
(\*File contains numerically searchable property data)  
Other Sources: DSL\*\*, EINECS\*\*, TSCA\*\*  
(\*\*Enter CHEMLIST File for up-to-date regulatory information)



61810 REFERENCES IN FILE CA (1967 TO DATE)  
3425 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA  
61906 REFERENCES IN FILE CAPLUS (1967 TO DATE)  
1 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

=> fil hcaplus

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FILE COVERS 1967 - 10 Aug 2000 VOL 133 ISS 7  
FILE LAST UPDATED: 9 Aug 2000 (20000809/ED)

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=> d his l4-

(FILE 'HCAPLUS' ENTERED AT 13:43:27 ON 10 AUG 2000)  
L4 398 S L2  
L5 61905 S L3  
L6 ~~13 S L4 AND L5~~

*same 13 hit as in L8 of  
previous  
search.*

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